EDITORIAL

Follow the Ball!

NEVER has it been more difficult in December to predict automobile output for the coming year with any degree of assurance than at the present time. So much depends on what the automobile manufacturers themselves do in the first three months of the year.

An exceptionally high output of cars in the first quarter might result in a surprisingly low total for the year. A first quarter production held conservatively in line with demand probably will mean stabilization throughout the year and relatively high totals.

Need for a conservative attitude as regards production in the first quarter of 1926 is indicated clearly by the latest reports from the retail field. The December survey of retail conditions just completed by *Automotive Industries* shows two significant facts:

1. Used car stocks are mounting and used car sales are slowing up.

2. The number of repossessions of cars sold on time is increasing in several areas.

To offset these unfavorable factors, several favorable aspects appear, such as continuation of new car sales at a reasonably good level for December and sound conditions for general business in nearly every line.

Automotive prosperity for 1926 lies very largely in the hands of the industry itself.

The Federal Aid Battle

THE long expected fight on the Federal aid road program now seems certain to take place soon. With the representatives of important eastern states and probably President Coolidge arrayed against a continuance of Federal aid in highway building, the whole policy is in for more serious opposition than ever before. Senator Reed of Pennsylvania apparently has been chosen to lead the fight against Federal aid.

But the Federal aid program will not be beaten without a terrific battle on the part of its proponents. Had it not been for Federal aid in constructing highways in the various states, thousands of acres of land which now are under cultivation probably would be barren; development of new communities would have proceeded at a far slower rate; and what money was spent in highways would have been applied far less efficiently. The possibility of coordinating in a national way the local road expenditures is one of the most important results of Federal aid. The National government helps in the construction of only such roads as seem to fit into a broadly conceived, logically worked out scheme of national highways. Thus it makes possible the development of good roads on an efficient and economic basis.

And when Federal aid goes on trial before Congress in the next few months, the effectiveness and intelligence with which it has been administered for many years under Chief Thomas H. McDonald will bear heavily in its favor. The disbursement of Federal aid funds has been handled in such a way, generally speaking, as to get the best results out of each dollar expended. The consequence should be a continuance of this important work.

Changing Horses in Mid-Stream

THE pages of American business history are filled with the struggles made by one industry to survive while another, born of newer and better ideas, was coming into ascendancy But with each new industry have come new and bigger business opportunities and thousands of men have stepped from comparative obscurity to fame and fortune by having the courage, foresight and ability to move from one business to another when the handwriting became apparent on the wall.

A striking case in point is that of the Studebaker Corporation, the financial history of which is given elsewhere in this issue. This firm under the name of the Studebaker Brothers Manufacturing Company, was one of the most successful builders of wagons and buggies in the world when the automobile began to get public recognition as a practical utility.

This was a critical period in the careers of the builders of horse-drawn vehicles. They stood at the fork of the road. In the 43 years of its existence the Studebaker Brothers Company had earned net profits of $16,000,000. That was a lot of money and doubtless the management hesitated to abandon a business which had been so lucrative. In all probability the men comprising the management spent many days and many nights debating among themselves whether they would cling to the buggy business and take a chance on surviving or whether they would risk their future entirely in the new field opening up before them. With courage and foresight they elected to take the latter course. How wisely they decided is told in figures which show that during the 14 years of the organization's activity in the automotive field as the Studebaker Corporation its net profits have been $115,000,000—this as compared to the $16,000,000 earned previously over a period of 43 years!

Of such men is the automotive industry made. The day may come when airplane development will place the automobile companies of today in the position of the buggy builders twenty years ago. If such ever comes to pass, we know where the new industry will find its leaders. In fact, a very considerable share of the development in the aeronautical field already has been sponsored by automobile builders and engineers.

AUTOMOTIVE NEWS SECTION INDUSTRIES

Philadelphia, Pennsylvania

Thursday, December 10, 1925

Seasonal Decline in Output, Satisfactory Sales, Mark Trade

PHILADELPHIA, Dec. 10—With many factories shutting down this month for the annual inventory and for various changes in machinery and plant layout it is likely that the production total of cars and trucks will be the lowest since early in the year, and well below the total of 379,300 units which was turned out in November, marking a new record for that month. Sales continue on a satisfactory basis, taking the country as a whole and considering the season of the year.

Dealers are stocking steadily with new cars. Their fears that they would have to absorb the difference between the old tax rate and the new one that is expected to be effective in March or April of 1926 have been dispelled by the action of the House Ways and Means Committee in deciding to make the reduction cover cars in stock when the new schedule goes into effect.

Production 5.6% Above Record

The production total for the year to date, 3,997,954 cars and trucks, exceeds the record total of 11 months in 1923 by 5.6 per cent. It is thus likely that even with curtailed output this month the total for the whole year will be from 20,000 to 50,000 higher than the previous record-breaking year.

Looking a little ahead, the favorable indications for the new year are the low prices and attractive quality of the cars now in production and the signs of industrial advance that apparently augur well for general prosperity. On the other side of the ledger are the over-supplied used car market; a gain in repossession of cars sold on time—which may, however, be merely seasonal; the possibility that too large stocks of new cars may be built up before the Spring selling season begins, and the possibility that the price cuts and liberal selling terms of 1925 may have anticipated the normal 1926 market.

Rollin Motors File Bankruptcy Petition

CLEVELAND, Dec. 10—A voluntary schedule in bankruptcy, listing assets at $741,380.93 and liabilities at $958,035, was filed here late today in Federal Court by the Rollin Motors Co. The schedule, filed by Grover Higgins, assistant secretary, pointed out that the company's financial affairs were laid before its directors on Dec. 7, at which time it was decided to wind them up.

Company officials say that the Rollin car, out of production for several weeks, had not sold with the rapidity anticipated, and, with a view of insolvency proceedings, the company's assets had been liquidated quietly over a period of several months.

Studebaker Issues New Finance Plan

Arrangement With I. A. C. Provides for Insurance on All Cars Sold

NEW YORK, Dec. 10—Through the Industrial Acceptance Corp. and one of the oldest and largest insurance companies in the country, the Studebaker Corp. of America has just made effective a new financing plan, whose rates are described as just as low and in some cases lower than those available from any other manufacturer.

P. M. Hall, vice-president of I. A. C., said today that these rates reduced the delivered price to a minimum. Fire and theft insurance are included in the plan and applied to every car sold.

Insurance is placed through the 35,000 local agents of the insurance company, so that a purchaser obtains real insurance service through the personal interest of the local agent.

The plan under which Studebakers were sold formerly required higher rates and offered no automatic insurance. The new plan is with recourse in every instance, and conforms to the regulations adopted by the National Association of Financing Companies. Down payment of at least 33 1/3 per cent and time payment over a period of twelve months are the rule, although, in extraordinary instances, longer time may be granted.

Change in Company's Name

CLEVELAND, Dec. 8—The Baker R & L Co. has changed its corporate style to the Baker-Raulang Co. The company is a quantity producer of closed bodies for automobiles, under the name "Raulang," and also a line of electrical industrial tractors and trucks, under the name "Baker." The change is a change in name only, as ownership and management remain as before.

E. J. Bartlett, for many years vice-president and general manager, was recently elected president.

REDUCTION MADE IN CAR LIABILITY RATES

NEW YORK, Dec. 9—Average reduction of 1 per cent in automobile liability rates offered by private companies is expected to mark the new schedule to become effective Jan. 1.

It is said that such reduction is made possible by slightly improved loss experience. A larger reduction will be made in the rates on higher priced cars, admitted in the insurance field to be too high, and one company not a member of the National Automobile Underwriters' conference recently threatened to file lower rates.

Collision rates planned by the Western Automobile Underwriters' Conference are expected to be about 20 to 25 per cent lower than those of the National Bureau of Casualty & Surety Underwriters, and this will probably revive discussion of the proposal that all classes of automobile risks should be handled by one organization, the National Conference.

Congress Considers Automotive Bills

WASHINGTON, Dec. 10—The introduction of three bills into Congress this week directly affecting the automobile industry marked the opening session of the Sixty-ninth Congress. They are:

1. The tax bill (H R 1) repealing the 3 per cent tax on automobile trucks and automobile wagons; repealing the 2½ per cent on tires, inner tubes, parts, or accessories, and reducing the tax on automobiles and motor cycles from 5 to 3 per cent.

2. A second tax bill, introduced by Congressman Grant M. Hudson, of Michigan, for the repeal of all automotive taxes, and

3. The Dowell bill, introduced by C. C. Dowell, of Iowa, providing for $196,000,000 Federal aid for highway construction for fiscal years ending June 30, 1928 and 1929, one-half to be expended in each year.

In addition to these three measures, assurance was given representatives of truck manufacturers that an amendment would be introduced on the floor, providing protection to dealers and agents who have trucks on hand when the bill is passed, making the repeal retroactive, along the same line as was agreed upon last week, which would permit a rebate to passenger car dealers on cars in stock.

Action by the House on the measure is expected to begin next Monday or Tuesday and the automobile section will probably be reached on Wednesday or Thursday.

M. & A.M.A. Not to Merge with A. E. A.

Board of Directors Decides to Remain an Organization of Manufacturers

NEW YORK, Dec. 7—The proposal to merge the Automotive Equipment Association and the Motor and Accessory Manufacturers Association was disapproved unanimously by the board of directors of the M. & A. M. A. at a meeting here last Friday. The action caused some surprise in trade circles, as it had been generally supposed that final consideration would be given the question at the annual meeting of the association in January.

The A. E. A., at its Chicago convention last month, approved the merger.

Reasons for Action

In connection with the action of the M. & A. M. A. board, the following notice was sent to members:

"When the merger of this association with the Automotive Equipment Association was first suggested, the idea met with a certain amount of favor. On the surface it seemed to be a progressive move for both associations. Several months have now been given to intensive study and investigation of the subject, and your board of directors after thorough consideration of all the advantages and disadvantages of such a merger, has concluded that the interests of our membership and of the industry would be served best by continuance of this association as constituted at present, that is, as an organization of manufacturers.

"The board therefore at its meeting held in New York, Dec. 4, unanimously voted to disapprove the proposal to consolidate or merge this association with the Automotive Equipment Association."

The board accepted the resignation as president and director of the association of E. P. Chalfant, vice-president of the Gill Manufacturing Co., who has accepted the executive vice presidency of the National Standard Parts Association. Mr. Chalfant has been an M. & A. M. A. director for two years and was elected president last January. The board also accepted the resignation as director of E. V. Hennecke, vice-president of the Moto-Meter Co., who was elected in November a director and vice-president of the Automotive Equipment Association.

Locomobile Adds "8" Junior Coupe to Line

BRIDGEPORT, CONN., Dec. 7—Announcement of the addition of a coupe to its Junior Eight line has been made by the Locomobile Co. of America. The new model, which sells at $2,265, is a two-door, four-passenger job, finished in gray paint and varnish, with black trimmings, mounted on natural wood artillery wheels. Brown wool whip-cord upholstery is used in the coupe, but leather upholstery can be obtained if desired.

Standard equipment furnished with this model includes front bumper, shock absorbers, automatic windshield wiper, sun visor, cowl ventilator, rear vision mirror, engine heat indicator, rear traffic signal, cowl lights, and ignition, door and gearset locks.

Roamer Car Prices Are Revised Upward

KALAMAZOO, Dec. 5—An upward price revision has been announced by the Roamer Motor Car Co., affecting the "6-50-55" Six-cylinder and "8-88" Eight-cylinder models. This revision brings the prices of the models affected back to where they were before the middle of October when a price cut was announced.

The following summary shows the changes in the price listing:

Model	Former Price	New Price
Roamer "6-50-55"		
Business Coupe	$1295	$1495
5 Passenger Coupe	1395	1495
Deluxe 5 Passenger Sedan	1595	1695
Roamer "8-88"		
5 Pasenger Touring	2395	2495
5 Passenger Spec. Sedan.	3285	3785
7 Passenger Sedan	3185	3285
5 Passenger Brougham...	2785	2895

New Peerless "Six" Sedan Announced

CLEVELAND, Dec. 7—A second model on the new light six medium-priced chassis has been announced by the Peerless Motor Car Co.

The new model, a five-passenger two-door sedan, is a variation of a standard sedan announced Nov. 19, and will list at $1,495, or $100 less than the four-door sedan.

Equipment furnished is identical with the formerly announced model.

Nash Co. Announces New Business Coupe

KENOSHA, WIS., Dec. 7—Announcement of a new two-passenger business coupe listing at $1,165, mounted on the special six chassis, has just been made by the Nash Motors Co. The new model, which is the lowest-priced closed model manufactured by the Nash Motors Co., is finished in a two-tone green-gray duco, with leather upholstery.

Equipment, furnished at list price, includes a set of five disk wheels, automatic windshield wiper, sun visor, cowl ventilator, rear vision mirror, cowl-lights, and door and gear-set locks.

Hertz Sedan Price Increase

CHICAGO, Dec. 10—The Yellow Truck & Coach Mfg. Co. has increased the price on the Hertz sedan from $1,695 to $1,795.

Business in Brief

Written exclusively for AUTOMOTIVE INDUSTRIES *by the Guaranty Trust Co., second largest bank in America.*

NEW YORK, Dec. 10—The action of the Bank of England in raising its discount rate from 4½ to 5 per cent. was without apparent effect on the domestic credit and business situation. The rate of the Federal Reserve Bank of New York remained unchanged at 3½ per cent. There was continued activity in the New York stock market, with prices generally firm. Wholesale trade was seasonally quiet last week, while retail trade expanded rapidly under the influence of holiday buying. Industrial activity continued to increase moderately. Further advances were reported in general commodity prices.

DEPARTMENT STORE SALES

Sales of department stores in the New York Federal Reserve district were 15 per cent. larger in October than a year earlier. The corresponding increase in sales of chain stores was 25 per cent. Sales of the F. W. Woolworth stores last month amounted to $20,676,964, as against $19,365,467 in November last year. Gains were also shown in sales of the W. R. Grant Co. and Oppenheim, Collins & Co.

PIG IRON PRODUCTION

Production of pig iron last month totaled 3,015,482 tons, as compared with 3,023,370 tons in October and 2,509,673 in November last year.

CAR LOADINGS

Car loadings in the week ended November 21 numbered 1,057,674, as compared with 1,050,758 in the preceding week and 1,010,919 in the corresponding period last year.

PRICE INDICES

Fisher's index of wholesale commodity prices advanced last week for the sixth consecutive time, standing at 161.3, as against 160 in the preceding week and 158.6 four weeks earlier. Bradstreet's index rose by about ½ of 1 per cent in November.

FEDERAL RESERVE STATEMENT

Bills and securities held by the Federal Reserve banks increased $26,400,000 in the week ended December 2, with gains of $19,200,000 in discounts and $7,100,000 in Government securities, and a decline of $1,700,000 in open market purchases. Note circulation increased $11,200,000 and deposits $22,200,000, while reserves decreased $3,000,000. The reserve ratio declined from 71.1 to 70.5 per cent.

MONEY

Call loan rates were somewhat higher last week, with a range of 5 to 5½ per cent, as against 4½ to 5 per cent in the preceding week. A firmer tone was apparent also in time money, though the rate of 4⅞ to 5 per cent was not quotably changed. Commercial paper rates remained at 4¼ to 4½ per cent.

Automotive Steel Market Quiet

Conservatism in Placing 1926 Orders Noted—Old Contracts Are Rushed

NEW YORK, Dec. 10—Automotive consumers of steel products are pursuing a policy of prudent conservatism in covering their initial 1926 requirements. Purchasing agents concentrate their efforts on speeding up shipments of material due on old, lower-price contracts.

Sheet and strip prices are firm, and while an especially attractive order for black sheets may bring out from one or another mill a concession of $1 a ton, the market on the whole appears to be uniformly established on the basis of the recent upward revision of prices.

Sheet Rollers at Capacity

Rollers of full-finished automobile sheets operate at virtually capacity. Again, however, they face a rising market for their semi-finished material. All sorts of quotations are heard in the sheet bar market, the heretofore prevailing $36 quotation being still named by some mills, while others quote $37 and even $38, and there are some sheet bar producers who frankly declare themselves out of the market for the present. The majority of the non-integrated sheet-rolling mills is fairly well protected for early 1926 requirement at around $36, but the higher sheet bar prices named in some quarters emphasize the opinion of certain market factors that the advance in sheets has not yet run its full course.

Strip steel prices rule firm. Although some of the hot-roll mills could take on more business at this time, they are rather pleased that some of the demand is hanging fire, and that there is a possibility of the market working higher before these orders come out. Bolt and nut manufacturers report a slight tapering off in automotive demand.

It is interesting to note that the seasonal decline in the activities of motor car plants is felt nowhere more sharply than in the scrap iron market, where lessened offerings by motor car plants cause a noticeable gap.

The Metal Markets

Pig Iron—Demand from automotive sources is of retail proportions. Foundry and malleable rule easy at $20.50, valley, and $23, lake furnace, for Michigan delivery.

Aluminum—The sole domestic producer is providing further for the steady growth in the demand for aluminum by the erection of an addition to its Massena (N. Y.) plant, which formerly served exclusively for the reduction process, but finished aluminum products are to be turned out there in the future.

Copper—After dipping to the 14-cent level, the market came in for speculative support and rallied moderately. In view of the inventory period's approach, however, consuming demand is confined to immediate needs.

Tin—Spot tin continues extremely scarce. Some consumers were compelled to buy higher-priced Straits tin in place of 99 per cent metal of which the spot market seemed to be bare. Tin bids fair to close the year at the highest price level in five years.

Lead—Diversion of Mexican lead from its European destination to the American market, a slight easing off in the demand, and brisk competition among producers are responsible for somewhat more normal conditions in the lead market.

Zinc—While nearby deliveries are not in over-plentiful supply, the market for futures is easier.

GRAHAM ENLARGES STOCKTON PLANT

SAN FRANCISCO, Dec. 10—Following the announcement of the purchase of Graham Bros. by Dodge Bros., Inc., it is officially stated here that $200,000 is to be expended immediately in the enlargement of Graham Bros.' factory at Stockton, California. Four new buildings are to be erected to house an assembling plant for both Dodge passenger cars and Graham trucks. Joseph Graham, one of the three brothers, is coming here to approve the plans for and supervise the construction of the new plant.

Graham Bros. entered Stockton about one year ago and invested approximately $90,000 in building a factory on a 30-acre tract leased for a 99-year period.

Edgar P. Day

DETROIT, Dec. 5—Edgar P. Day, representative in Michigan and Ohio of the Business Publishers International Corp., of New York, died suddenly here this morning while asleep at his home. Death was due to heart trouble.

Mr. Day, as representative of the Business Publishers Corp., formed some months ago to publish El Automovil Americano and The American Automobile (Overseas Edition), as well as other export magazines, was widely known throughout the industry, particularly in its export section. He joined the staff of the Class Journal Co., which then published these two magazines, about four years ago and represented them not only in the Detroit section but in Illinois, Indiana, Wisconsin, Minnesota and Missouri. Following the formation of the new company in August, his headquarters were returned to Detroit where, in addition to the two automobile magazines, he also represented Ingenieria Internacional, which the new company took over from McGraw-Hill Co., Inc.

Automotive Taxes for 10 Months Slump

Total $115,000,000 Against $122,000,000 Last Year—Michigan Leads

WASHINGTON, Dec. 10—Internal revenue receipts from the automotive industry for the first ten months of 1925 totaled $115,628,121.68, or $6,411,341.10 less than for the first ten months of 1924, when collections were $122,039,462.78, it is announced here by the Internal Revenue Bureau.

Segregation of the collections shows that automobile trucks and wagons for the current ten months netted but $6,734,795.73, as compared with $9,452,175.75 for the first ten months of 1924. other automobiles and motorcycles ran up a slight gain with $89,986,071.80 in collections for the first ten months of 1925 as compared with $88,056,044.28 for the first ten months of 1924 and tires, parts or accessories brought $18,907,254.15 for the first ten months of 1925, as compared with $24,531,242.75 for the first ten months of 1924.

Collections of 12 Main States

Perusal of the collections from the twelve principal automotive-producing States shows that Michigan slumped badly during the first ten months of 1925, when her collections from "automobile trucks and wagons" were but $1,011,468.57 as compared with $4,269,007.79 for the first ten months of 1924, when she was the outstanding revenue-paying State in this item. For the first ten months of the calendar year, Ohio led in the collections from "automobile trucks and wagons" with $2,149,553.16.

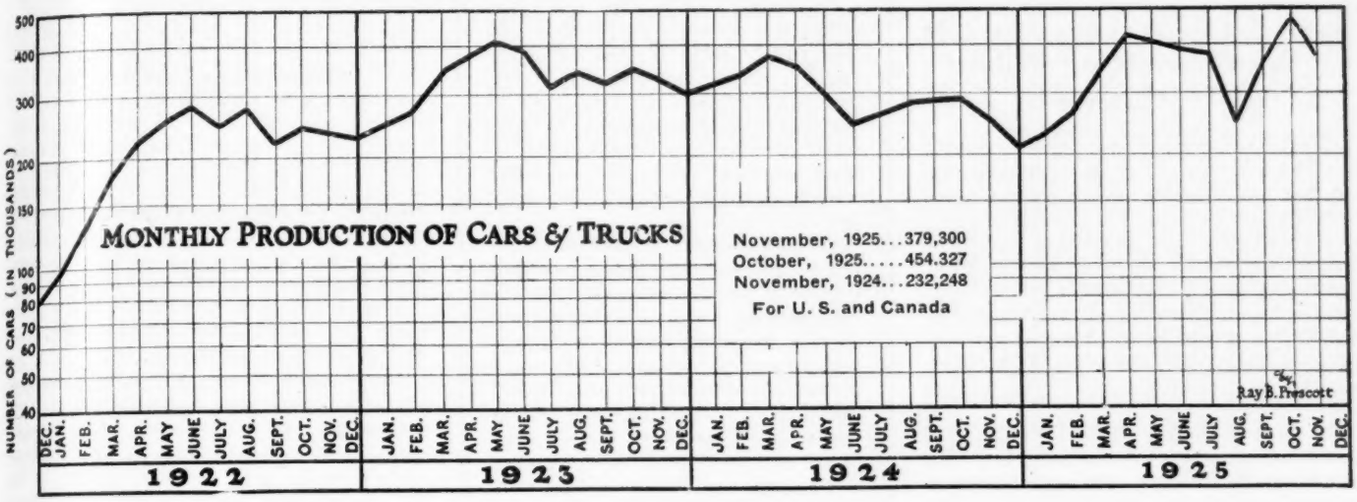
The three outstanding States in paying revenue on "other automobiles and motorcycles" during the first ten months of 1925, maintaining the same rank they held for the same period in 1924, follow: Michigan, first, with $65,988,525.06; Ohio, second, with $7,011,932.15, and Indiana, third, with $6,981,391.98.

Boston Seeks Next Schneider Cup Races

BOSTON, Dec. 10—To secure the world record airplane Schneider cup speed races for Boston, a fund of $1,000 was pledged this evening, and a committee named to extend an invitation at the December meeting of the New England section of the S. A. E. held at the Hotel Somerset. This meeting was an aviation one, and was held during the week of Boston's second aviation show, which opened at Mechanic's Building Tuesday evening in conjunction with a bazaar to raise funds to erect a clubhouse for enlisted men in the Army and Navy.

At the S. A. E. meeting, presided over by M. R. Wolford, the speaker was C. G. Peterson, engineer for the Wright Aeronautical Corp.

November Production Shows Seasonal Decline



Urge More Research in Aviation Growth

WASHINGTON, Dec. 10—"America is at least abreast of other progressive nations in the technical development of aircraft for military purposes," says the National Advisory Committee for Aeronautics in its eleventh annual report which has just been submitted to Congress by President Coolidge.

In discussing national defense, the Committee, stating in its report that America cannot hope to obtain leadership in all respects, points out that in time of emergency the United States must depend upon the results of technical research and development continuously carried on.

In dealing with commercial aviation, the report states that the Committee regards the initiative shown by private companies in establishing airlines, and the relatively large number of responsible offers for the carrying of air mail by contract, as the most encouraging factors in the last year. The Committee says that the most pressing needs at the present time are:

1. Legislation establishing the fundamental right of flight, creating a Bureau of Air Navigation in the Department of Commerce for regulating and licensing of aircraft, airports and aviators, for the establishment, maintenance, and lighting of adequate national airways, and to provide for the necessary meteorological information.

2. Technical improvements in airplane design.

3. Assistance from other Government agencies such as the hydrographic office, the coast and geodetic survey, weather bureau, etc.

The growth of commercial aviation in the opinion of the Committee will probably bring to the fore a new series of problems peculiar to commercial aviation and aircraft. Annual meetings with the engineering representatives of aircraft manufacturing and operating industries have therefore been decided upon, so that the Committee may be able to cooperate as far as practicable with the commercial aircraft industry in the solving of its problems.

The report touches but very lightly on the lighter-than-air question. It says that the time has arrived for making a definite decision as to whether research in the airship field is to be carried on or not, adding that it would be a serious error "to adopt a policy of merely marking time in the development of airships." It is of the opinion that such development should be carried on.

Further recommendations of the Committee included in the summary of the report are for the gradual extension of air transportation of mails and a reiteration of its recommendations in previous reports for the establishment of a Bureau of Air Navigation in the Department of Commerce.

In submitting the report of the Committee to Congress, President Coolidge emphasized that the opinion of the National Advisory Committee for Aeronautics was the most authoritative to be had and that the continuance of the Committee "is essential if America is to maintain its present advanced position in aircraft development."

Ohio Electrical Co.'s Combine in Merger Plan

TOLEDO, Dec. 8—A combination of a number of electrical equipment companies in Ohio into a large holding company is reported under way.

The W. G. Nagel Co. here, and the Erner & Hopkins Co., Columbus, are two of those interested. Other large concerns in Cleveland, Cincinnati, Akron and Dayton, and one in Detroit, all wholesale and distributor representatives of the General Electric Co., are said to be involved in the merger plan. Combined properties will run to approximately $3,000,000.

Further details, it is said, will be announced in two or three weeks.

Rubber Exchange to Open Jan. 15

NEW YORK, Dec. 7—The Rubber Exchange of New York, plans for which were announced recently by F. R. Henderson, president of the Crude Rubber and Foreign Produce Corp., 250 West 57th St., is expected to open for trading about January 15, with at least 100 members.

Despite the fact that the Rubber Trade Association opposed inauguration of the exchange at this time, and that the New York Cocoa Exchange has appointed a committee to confer with trade interests regarding arrangements for trading in rubber and rubber products on the floor of the Cocoa Exchange, Mr. Henderson and his associates are proceeding with the plan for an independent exchange in the conviction that rubber's increasingly important place justifies such action. They believe that crude rubber, which was fourth among imports last year, will be higher than sugar this year and will obtain first place in value of imports in 1926.

They do not believe that the recently announced increase under the Stevenson Act of the exportable allowance from British Malaya and Ceylon to 100 per cent, effective Feb. 1, will bring about any material change in the price of crude rubber. The increase to 100 per cent will release about 15,000 additional tons for the quarter beginning Feb. 1, but this is not regarded as sufficient to lower the price, and already crude rubber on the London market has reached a new high after reacting under the first influence of the increase by the Stevenson rubber committee.

10,000th Ajax in 6 Months

RACINE, WIS., Dec. 10—The ten-thousandth Ajax Six left the Ajax Motors plant here late in November, just six months after the first Ajax was produced.

S.A.E. Men Inspect Carpenter Steel Co.

Pennsylvania Section of Society is Guest at Reading Plant—Delong Speaks

PHILADELPHIA, Dec. 9—About fifty members of the S. A. E. Pennsylvania Section attended the monthly meeting of the Section at Reading yesterday.

At Reading, an inspection trip was made through the plant of the Carpenter Steel Co., where the visitors were shown details of the processes of manufacturing alloy and carbon steels for the automotive industry in Herault electric furnaces, and of the annealing and rolling of the steel ingots.

In the evening Dr. B. H. Delong, chief metallurgist of the Carpenter Steel Co., gave a talk on "The Elements Used in Alloy Steels."

He stated that it had been claimed of vanadium that it increased the fatigue resistance of steels, but he had never seen experimental proof to this effect. In the discussion it was brought out that oftentimes failures in steel that are ascribed to fatigue by the engineers, are really due to an insufficient elastic limit. In one case, a rear axle-shaft gave trouble from failure, and the engineer was positive that it was a case of fatigue failure, but when the drawing temperature was lowered and the elastic limit thereby increased, the failures ceased.

Companies Engage Export Representatives

NEW YORK, Dec. 10—Maas & Sonneborn, 611 Fisk Bldg., here, have concluded negotiations with a number of companies, whereby they are to handle their export sales and export advertising.

Among these companies may be mentioned the Taft-Pierce Mfg. Co., of Woonsocket, R. I., manufacturer of a line of reamers, line reaming equipment and automotive service tools; the Thorn Machine Tool Corp., of Syracuse, N. Y., manufacturer of automotive equipment machinery; the C. Spiro Mfg. Co., of Dobbs Ferry, N. Y., manufacturer of automobile parts and accessories; the Atterbury Motor Car Co., of Buffalo, N. Y., truck manufacturer; the Yellow Jack-it Mfg. Co., of Chicago, Ill., manufacturer of high-powered automobile jacks; the Loomis-Beardsley Mfg. Co., of Columbus, Ohio, manufacturer of valve lifters and grinders, and the Lomar Mfg. Co., Middletown, Ohio.

Hercules Output 125 Daily

EVANSVILLE, IND., Dec. 10—The local automotive department of the Hercules Corp., building truck bodies, will be closed from Christmas until the beginning of the new year for annual inventory. C. S. Sanford, plant superintendent, has announced. Hercules truck body building department is maintaining a production schedule of 125 truck bodies a day. With the beginning of the new year, it is expected to step up this average to 175 bodies a day.

The opening of a new building here by Graham Bros., to be used as bus engineering and experimental department is said to be part of the program which the Grahams are planning for extending their activities in the motor bus building field. According to Mr. Sanford, it is proposed to raise bus building from the present 1 per cent to 5 per cent of total Graham production.

TIME SALES NOT UNDER USURY LAW

LOS ANGELES, Dec. 8—A decision was recently rendered in the Superior Court of Los Angeles county which declares that conditional contracts of sale used in the sale of automobiles or any other personal property upon a time payment plan do not come within the purview of the usury laws of California.

It is held that conditional contracts upon a time basis are distinctly contracts of sale upon a time-selling price and have none of the characteristics of a loan or forbearance of money within the meaning of the usury law. The decision holds that anyone selling personal property can have a cash price and also can have a time-selling price, which is considerably higher than the cash sales price. In fact, there is no limit from a legal standpoint as to the amount that can be added by the dealer, if desired, upon a time sales basis.

N.M.B.A. and A.A.A. Will Consolidate

WASHINGTON, Dec. 10—As a result of the agreement reached by the executive committees of the American Automobile Association and the National Motor Bus Association at Detroit recently to consolidate into one National organization, the way is now cleared for immediate attention to the serious question of inter-state legislation. The consolidation makes possible an unhampered and active co-operation.

The agreement signed by the committees recommends the establishment of a self-governing bus division which will have adequate representation on the various governing boards of the A.A.A. Tentatively, the various State organizations not yet represented in any National organization are requested to affiliate with the bus division of the A.A.A. as it today exists. After a sufficient number have joined, representatives of the various State organizations will confer for the purpose of organizing the new bus division and other necessary details. The executive committee of the National Motor Bus Association will represent the bus division in the meantime.

Receiver Appointed for Murray Body

No Cessation of Work at Plant—Shortage of Working Capital Cause

DETROIT, Dec. 7—The Guardian Trust Co. of this city has been appointed receiver for the Murray Body Corp. by Federal Judge C. C. Simmons. The company came into being a year ago upon the merger of the Towson Body Co., the Widman Body Co. and the C. R. Wilson Body Co. Later, the Murray Mfg. Co. was acquired as a subsidiary.

In taking over the company, officials of the bank said that there would be no cessation of work, and that the company would be continued as a going concern. The largest creditor is understood to be the Pittsburgh Plate Glass Co. Last year the J. W. Murray Mfg. Co. did a business of $7,898,061, as compared with approximately $10,000,000 in the previous year. Lack of working capital was said to be the reason for the receivership.

Ohio Company Not Affected

The "friendly" receivership of the Murray Body Corp. will in no way affect the Murray Ohio Mfg. Co., Cleveland, builder of automobile bodies, according to announcement in Cleveland by Clarence W. Hannon, general manager. The latter company is affiliated with the J. W. Murray Mfg. Co. of Detroit, as its Ohio representative. Dividends on the Ohio company are guaranteed by the J. W. Murray Co., which is not involved in the receivership.

Mr. Hannon said that, in addition to being distinct from the Murray Body Corp., the Ohio company expected soon to be distinct from the J. W. Murray Co. The former is offering in the market 40,000 shares of 8 per cent second preferred stock, and proceeds of the sale will be used to reimburse the J. W. Murray Co. for loans in the last year and for additional working capital.

The Ohio company manufactures automobile fenders and juvenile automobiles. Mr. Hannon added that his company was in excellent financial condition, its credit ratio showing 2¼ to 1.

The Guardian Trust Co., as the receiver, is now looking through the company's books, and will issue a statement shortly.

Plate Glass Men Hold Conference on Costs

WASHINGTON, Dec. 10—With representatives of American plate glass manufacturers, headed by Abraham Sullivan of New York, and J. Rafter, as representative of Belgian plate glass manufacturers, in attendance, hearings on the cost of production of plate glass and mirror plate in this country and abroad were concluded before the Tariff Commission here this week.

Cleveland Reports Business Excellent

CLEVELAND, Dec. 10—Reports made public here this week at the thirteenth regular meeting of the Great Lakes Regional Advisory Board—an organization made up of railroads and the heads of some three hundred shippers, among whom are a score or more automobile and parts manufacturers in Ohio, Michigan and New York—show clearly the trend of the automotive business in this district, as well as in the neighboring automotive center of Detroit.

Concerning the movement of automobiles, the advisory board's report states: "Freight car requirements of the automotive parts and accessory manufacturers show a total of 19,616 cars in this territory for the three months, November, December and January, which is an increase of about 2,384 cars, or about 15 per cent over the previous three months.

L. G. Macomber, president of the Detroit Board of Commerce, is president of the advisory board, and K. A. Moore, of the National Automobile Chamber of Commerce, Detroit, is vice-president.

Another report forthcoming this week from the Lake Carriers Association, whose members operated some 400 lake boats during the season which closed December 1, shows prosperity in the automotive field, according to reports.

While no definite figures are available concerning the number of automobiles and the tonnage of parts and accessories carried, George A. Marr, secretary of the association, stated that this phase of Lake business was heavier last Summer and Fall than ever before.

NEW-DAY JEWETT TOURING MODEL OUT

DETROIT, MICH., Dec. 7—List prices on the deluxe touring model and the chassis in the New-Day Jewett line have been announced by the Paige-Detroit Motor Car Co. The former is priced at $1,095, the same as the deluxe sedan, and the latter at $825.

Duesenberg Makes Several Model Changes

INDIANAPOLIS, Dec. 7—Changes announced by the Duesenberg Motor Co. on the Duesenberg straight eight for 1926 include a change in the fuel system. Whereas, formerly, a vacuum fuel feed installation was used, gasoline will now be piped to the carbureters under pressure. A Racine radiator and optional balloon tires included on wire wheels form the other main changes.

F. W. D. Brings Out New 3-Ton Trucks

CLINTONVILLE, WIS., Dec. 9—The Four Wheel Drive Auto Co. has brought out a number of new trucks which are intended to cover the complete range of service in the three-ton field. These models are built either with the engine in front of the driver's seat or under it as in the standard model B.

In the new BSU and BSD models, which are similar in appearance to the model B, two stage transmissions are used giving six speeds forward and two reverse. In the BSU, which is recommended for high speed service, high speed is an over-gear, while in the BSD, the top speed gives direct drive, this model being recommended for exceptionally heavy pulling. It can be furnished in gear ratios as low as 98.7 to 1.

Models M, MSU and MSD are short, heavy duty, 3½-ton trucks built with a reserve capacity for overloading. MSU has the same transmission arrangement as BSU while MSD corresponds to BSD. The design in the M models, however, is heavier than in the B trucks, as they are intended for more severe service. When a model is furnished with the engine in front of the driver's seat, the letter F is added to the model designation to indicate the fact.

Developments of the Week in Leading Motor Stocks

NEW YORK, Dec. 10—The course of prices for the motor stocks has been steadily upward during the week, punctuated only by periods of irregularity rather than of weakness. It is true that rumors again are in circulation as to possible, or probable, consolidations, but, in the main, the advance has been due largely to wholly speculative considerations. There has been some discussion of the present and prospective earning power of various motor companies and these have been used in advancing prices. But the general advance has been at the expense of those who sold stocks for future delivery, in anticipation of lower prices.

There has been less discussion of the credit situation although a 5 per cent call money rate has been the rule. Ninety-day money seems firmly established on the 5 per cent basis, and there is little likelihood of any easing of rates in the immediate future.

The leader of the motor group in speculative activity was Chrysler Motors, which advanced from the recent low of 170 to 225. There was nothing new either in the affairs of the company or in the industrial situation to explain the advance, technical market conditions alone being responsible. The rise of some twelve points in the price of General Motors was due in part to the retirement of short contracts, and in part to buying of a more substantial character. Chandler Motors was quiescent, following its burst of activity in the previous week. Semi-official reports from Cleveland indicated that the merger of this company with Cleveland Motors comprehended an exchange of Chandler Motor stock for an issue of 4 per cent preferred stock in a new holding company, and the speculative element believed that a price of 50 had discounted such an exchange.

Aggressive strength and an active market characterized the dealings in Paige-Detroit and Packard. There were rumors that the former company would declare a 40 per cent stock dividend, following which the stock will be exchanged for Packard on a share-for-share basis. An aggressive speculative clique was reported as interested actively in both stocks.

Among the accessory stocks, Stewart-Warner was the feature, advancing to a new high level. An obstinate short interest was responsible for some of the buying, while rumors connected the name of a prominent automobile manufacturer with it. As a matter of fact, it is probable that a realization of the steadily increasing earnings of the company, coupled with the recently increased dividend rate, have brought into the market a renewed demand of the semi-investment class.

Some rather palpable attempts to renew speculative interest in the rubber stocks, based upon cabled reports of a tremendous speculation in shares of rubber companies in London, failed. United States Rubber, Goodrich, Goodyear and others of this class, failed to respond.

The decline in United States Industrial Alcohol from a high of 98 to a low of approximately 70 this week, was based upon reports of competition in the manufacture of non-freeze compounds for automobiles. It is said that both Lever Bros. and Proctor & Gamble are actively marketing such compounds. There was some talk, too, of this company having lost a substantial volume of alcohol business on contract with the duPont interests. These reports were denied officially, but holders of the stock derived small consolation from the denials.

Elsewhere, strength alternated with irregularity, although the general trend of prices, especially in the rails and oils, was upward. The convening of Congress was without effect marketwise, the only legislation in which Wall Street has any especial interest being of a character which it is fond of calling "constructive." The President's message to Congress contained nothing startling, although some profit-taking upon its delivery resulted. There is a rather general feeling that before long the New York Federal Reserve Bank will tardily raise its rediscount rate, but the effect seems to have been discounted largely in the decline of prices last month, and would, in the opinion of most bankers, exert only a temporary influence.—H. H. S.

N. Y. Show to Have Italian Setting

More Elaborate Decorative Scheme Than at Any Previous Exhibition

NEW YORK, Dec. 10—A decorative scheme more elaborate than at any previous exhibition has been planned for the National Automobile show to be held at Grand Central Palace January 9-16. The background of the decorations will be a vast panorama of the Mediterranean, upon which 200 artists and artisans are already at work. The Palace interior will be fitted to resemble the exterior grounds of an Italian villa. Tall cypresses and spreading palms will conceal the columns of the building and there will be fountains and a profusion of flowers.

Court of Arts and Sciences

The central feature of the main floor will be a Court of Arts and Sciences, to be erected in the well of the mezzanine and to include ten statues, each 18 feet high, surrounded by cypresses, palms, myrtles and stone pines, all brought here from Italy.

The four main floors will be covered with specially imported linoleum, in imitation of native Italian woods, and the great opening in the mezzanine floor will be enclosed with flower boxes, hanging vines and roses.

The lobby on the Lexington Avenue side will be decorated after the manner of the reception parlor of the Doge's Palace on the Grand Canal in Venice, with rich hangings and tapestries, quaint lamps and statuary.

The decorative plan represents the joint efforts of Sam A. Miles, manager of the National Automobile Shows, and Sam Asch, the exposition architect, whose work in connection with the Silver Jubilee Shows a year ago gave him a National reputation in this line of work.

Perpetual License Tags Recommended

DETROIT, Dec. 10—If a suggestion made by Secretary of State Charles J. Deland and given considerable publicity by the local daily press materializes, the individual car owner will no longer be subjected to the task of annually renewing his license. Mr. Deland has suggested that, in all fairness to the public, the annual renewal of licenses should be done away with and a license sold when the car is delivered to the first customer which will stay with the car through its life and the necessary transfers of ownership, the plate for same to be so substantially made that it will last the life of the car.

The Michigan Automotive Trade Association has gone into the "perpetual license" plan thoroughly and declares in a bulletin that "while it is a radical departure from present procedure, it would be equitable in every way and workable, and that every dealer should be interested in seeing such a law passed in this State." The association is backing the idea and has sent out to all its members posters put out by Mr. Deland.

DODGE OVERSEAS SHIPMENTS, 29,156

DETROIT, Dec. 9—Dodge Bros., Inc., report overseas shipments of cars for the first ten months of this year as 29,156, as compared with 21,964 for the same period of 1924, an increase of 32.7 per cent.

Graham Increases Bus Body Building

EVANSVILLE, IND., Dec. 10—With the taking over of their new building at Stringtown Road and North Garvin St., here, Graham Bros. will enter on a production program of bus body building of about 5 per cent of total production as against the present 1 per cent, according to C. S. Sanford, executive assistant to President Graham.

The building erected by Graham last year was until recently occupied by the Evansville Planing Mill Co. for the building of Graham bus bodies. Graham Bros. will use the building as an engineering and demonstration department for the bus body building section.

The Evansville Planing Mill Co. recently purchased the old Karges Wagon Works property for $75,000, permitting them to carry on the bus body building department on a much larger scale.

Earl Motors Property Due to be Sold Jan. 25

JACKSON, MICH., Dec. 7—Sale of the real estate of Earl Motors, Inc., has been authorized in an order signed by Circuit Judge James A. Parkinson. The sale is scheduled to take place January 25 at the plant here.

The petition to sell was filed by Frank H. Shaw, receiver for the concern, and sets forth the buildings to be offered, which comprise a total of 300,000 square feet. Machinery and equipment have already been sold by the receiver and the sale of the property is all that remains to satisfy creditors.

Morse Chain Co. Production at Peak

DETROIT, Dec. 10—During the last few months, production at both the Detroit and Ithaca plants of the Morse Chain Co. has reached the peak.

At the sprocket plant, located here, average monthly production is running from 175,000 to 200,000 sprockets.

Chains are coming from the Ithaca plant at the rate of more than 5,000 a day.

British Policy Not to Affect Rubber

Removal of All Restrictions Will Mean Only Slight Increase in Output

AKRON, O., Dec. 10—Announcement of the British colonial office that all restrictions on crude rubber shipments will be lifted Feb. 1 had only a temporary effect on the rubber market. After declining a few cents last week, rubber futures have again started on the upward trend.

Akron leaders feel that the new British policy will not relieve the crude rubber shortage to any extent, although it may be of some value, from a sentimental standpoint, in curbing speculation in rubber. Eighty-five per cent of plantation production in the British Indies is now allowed to be shipped under terms of the Stevenson Restriction Act, it is pointed out, and another 10 per cent would have been automatically released Feb. 1, with a 100 per cent exportation allowed three months later.

A Diplomatic Gesture

The extra 5 per cent release is generally looked upon by rubber company executives as a diplomatic gesture to satisfy numerous protests from British and American interests. Shortage of labor in the plantation areas and previous restrictive measures, it is stated, will keep down production of rubber for many months, regardless of the restrictions being taken off.

"There will still be a rubber shortage, and America should continue its efforts to obtain a new source of supply," says Harvey S. Firestone, president of the Firestone Tire & Rubber Co., and a leader in the fight against British restrictions.

R. W. Litchfield, first vice-president of the Goodyear Tire & Rubber Co., states that the releasing of 100 per cent production will not increase the available supply of rubber, as the reported capacity of the plantations is probably not equal to 100 per cent rating, and furthermore rubber has been produced as fast as possible since August of this year.

Akron rubber brokers are of the opinion that the action of the Bank of England in raising its discount rate from 4½ to 5 per cent will be another factor in checking speculative interest in rubber, as well as other commodities. It is expected to bring out some liquidation of current holdings, which may depress the market.

Pierce-Arrows Are Provided Winterfronts

BUFFALO, N. Y., Dec. 10—All Pierce-Arrow cars now are being equipped at the factory with Winterfronts. In addition, the Series 80 models are being fitted with Houdaille shock absorbers.

New Bill Reduces Automotive Taxes and Provides Rebates

WASHINGTON, Dec. 10—The official language of the bill providing for the repeal of the automotive excise taxes is as follows:

TITLE VI—Section 600: There shall be levied, assessed, collected and paid upon the following articles sold or leased by the manufacturer, producer, or importer, a tax equivalent to the following percentage of the price for which so sold or leased—

(1) Automobile chassis and bodies and motor cycles (including tires, inner tubes, parts, and accessories therefor sold on or in connection therewith or with the sale thereof), except automobile truck chassis and bodies, automobile wagon chassis and bodies, and tractors, 3 per centum. A sale or lease of an automobile shall, for the purposes of this subdivision, be considered to be a sale of the chassis and of the body. This subdivision shall take effect on the expiration of 30 days after the enactment of this Act.

The official text of the bill dealing with the refund of automobile taxes is as follows:

Section 1204: (a) Where prior to the effective date of the repeal of subdivision of Section 600, dealing with the automobile taxes of the Revenue Act of 1924, any article subject to the tax imposed by such subdivision has been sold by the manufacturer, producer, or importer to a dealer, and is on such date held by a dealer and intended for sale, there shall be refunded to the manufacturer, producer, or importer an amount equal to 2 per centum of the price for which such article was sold by him, or, if the tax has not been paid, an amount equal to such 2 per centum shall be credited against the tax in respect of such article.

(b) As used in this section, the term "dealer" includes a wholesaler, jobber, or distributor. For the purposes of this section, an article shall be considered as "held by a dealer" if title thereto has passed to such dealer (whether or not delivery to him has been made), and if for purposes of consumption title to such article or possession thereof has not at any time been transferred to any person other than a dealer.

(c) Under regulations prescribed by the Commisioner with the approval of the Secretary, the refund provided by this section (1) may be applied as a credit against the tax shown by subsequent returns of the manufacturer, producer, or importer, and (2) may be made to the dealer instead of to the manufacturer, producer, or importer, if the manufacturer, producer, or importer, waives any claim for the amount so to be refunded.

(d) When the refund or credit provided for in this section has been allowed to the manufacturer, producer, or importer, he shall remit to the dealer to whom was sold the article in respect of which the refund or credit was allowed, so much of that amount of the tax corresponding to the refund or credit, as was paid or agreed to be paid by the dealer. Upon the failure of the manufacturer, producer, or importer, to make such remission he shall be liable to the dealer for damages in the amount of three times the amount thereof, and the court shall include in any judgment in favor of the dealer in any suit for the recovery of such damages, costs of the suit and a reasonable attorney's fee to be fixed by the court.

Champion Spark Plug Co. Builds Addition

TOLEDO, Dec. 8—A new six-story factory building to duplicate its present main plant will soon be under construction by the Champion Spark Plug Co., here, R. A. Stranahan, president, announced today. This addition will enable the company to increase its output to 50,000,000 spark plugs for next year.

Improvements costing $500,000 will also be made. Some departments have already undergone expansion this year. Changes are also being made in the general layout of the Champion Porcelain Co.'s plant at Detroit.

"In 1925 we have produced more than 40,000,000 spark plugs, and this enormous production has compelled us to put on night shifts in many departments," said President Stranahan. "The new building is a part of our general plan to increase capacity to 75,000,000 spark plugs a year as rapidly as possible as the market for motor cars and other types of internal combustion engines becomes sufficient to justify that volume.

American Lamp Buys Mirroscope

NEW YORK, Dec. 10—The American Auto Lamp Co., Inc., has purchased the patents, trade marks, dies, tools, equipment, etc., of the Mirroscope Co. of America, Inc., Portchester, N. Y.

FINANCIAL NOTES

Firestone Tire & Rubber Co.—The last report of this company, showing an increase in sales of approximately $40,000,000 for the fiscal year ended Oct. 31, is regarded as an indication of what may be expected from statements of other rubber companies for the year. Total sales of the Firestone Co. for 1925 were $125,597,993, compared with $85,610,000 in 1924. Net income, after depreciation, Federal taxes and interest, was $12,800,412, against $7,116,689, in 1924.

The balance sheet shows a surplus of $39,762,281. Total assets are $72,298,535, of which $43,500,000 are net quick.

Announcement is made of the sale of $10,000,000 additional 7 per cent preferred stock. Officials of the company explained that the expansion of business and the high cost of crude rubber require a larger working capital.

Richmond Radiator Co.—Directors have declared an extra dividend of 16 2/3 cents a share on the new preferred stock, payable Jan. 15 to holders of record of Dec. 31. This dividend is in addition to the regular quarterly dividend of $1.75 a share on the old preferred, payable Jan. 15, 1926, declared Jan. 15, 1925. The old preferred was split some time ago on the basis of three for one, so that the 16 2/3 cents a share payment makes the ratio for the final quarter 75 cents a share on the new stock.

The McKinnon Industries, Ltd.—A new issue of $1,000,000 7 per cent cumulative redeemable preference shares of this company is being offered by R. A. Daly & Co. and Doherty-Easson Co., Ltd., at 98 and accrued dividend per share, with a bonus of one-half share of no par common stock. The fractional shares of no-par value will be adjusted at $15 per share.

Hayes Wheel Co.—This company called for payment Feb. 1, 1923, at 102½ and interest, the entire issue of its 1st 7s and 6s, due Feb. 1, 1929, Series "A" and "B," at L. E. Higginson & Co., New York, Chicago and Boston.

Aircraft Corp. of America—It is announced that the Irving Bank-Columbia Trust Co., New York, has been appointed transfer agent of the Class A and Class B stock of this corporation.

Mack Trucks Real Estate, Inc.—The Chase National Bank, New York, has announced that it was prepared to exchange the outstanding 6 per cent secured gold notes, Series A, of this company for the definitive notes.

Stutz Motor Car Co. of America, Inc.—The New York Curb Market has admitted to unlisted trading privileges this company's $1,000,000 15-year 7½ per cent convertible gold debenture bonds, due Oct. 1, 1937.

Jordan Motor Car Co.—This company has declared regular quarterly dividend of 75 cents on common and 1¾ per cent on preferred, both payable Dec. 30 to stock of record Dec. 15.

Mack Trucks, Inc.—The stockholders have authorized an increase in common stock from 500,000 to 1,000,000 shares of no par value.

Electric Auto-Lite Co.—This company has declared extra dividend of 50 cents and regular quarterly of $1.50, both payable Jan. 2 to stock recorded Dec. 15.

Men of the Industry and What They Are Doing

Parker a Lecturer

The Division of Highway Engineering and Transportation of the University of Michigan has announced the appointment, as a non-resident lecturer of Highway Transportation, of Carl Parker, manager of the bus department of the Reo Motor Car Co.

Mr. Parker has had an opportunity afforded few other men of making a very close study of motor bus transportation, and the scientific methods of handling passenger traffic and of bus operation.

McDowell President

John W. McDowell, trustee in bankruptcy for the Avery Co., Peoria, Ill., has been elected president of the newly formed successor company, the Avery Power Machinery Co. An Illinois charter was issued the new company, authorizing $500,000 common stock and $200,000 preferred.

Firestone Reports Progress

Harvey Firestone, Jr., sent abroad by his father to organize the Firestone Plantation Co., said upon his return that development of the Firestone enterprise in Liberia would begin soon with the nucleus consisting of the 2,000 acres already placed under production for the Firestone interests since before the war.

Saunders With Olds Co.

B. Murray Saunders has joined the advertising department of Olds Motor Works. For the last four years Mr. Saunders has been with the Campbell-Ewald Co. agency, both in production work and assisting in account contacting.

Brinkerhoff Sales Manager

W. H. Brinkerhoff has joined the Standard Motor Truck Co. of Detroit, as Eastern district sales manager. Mr. Brinkerhoff has served for thirteen years with the Studebaker Corp. and he is well known throughout the East.

Ayr Factory Manager

David Ayr has been appointed factory manager for the Pratt & Whitney Co., manufacturer of machine tools, Hartford, Conn., and Frank O. Hoagland is now master mechanic.

Sossong Elected President

Ray A. Sossong, manager of the gas plants for the Air Reduction Sales Co., New York, was elected president of the International Acetylene Association at its recent convention in Chicago.

M. Edward to Arrive Dec. 20

M. Edward, authority on automotive trade conditions in South Africa, will arrive in this country from Johannesburg about Dec. 20 on a business trip.

FOKKER ENTERTAINS ABOVE THE CLOUDS

While a three-engine Fokker aeroplane loafed in the clouds, at altitudes varying from 2,000 to 6,000 feet, a party of automobile executives were the guests of the designer, Anthony H. G. Fokker, at luncheon Tuesday.

Included in the party were C. Harold Wills, president of the Wills Ste. Claire Automobile Company; Herbert Book, Jr., R. W. Judson, president of Continental Motors Corporation; H. L. Wadsworth, E. S. Jordan, president Jordan Motor Car Company; Chas. H. Davis, secretary of Lansing Chamber of Commerce. Lieut. George R. Pond was pilot; newspaper men and cameramen made up the rest of the party.

Belknap to McFarlan

Robert B. Belknap, who for the last few years has been identified with the Lexington Motor Co. in various executive capacties, has left the position of assistant to the general manager of that organization, and has accepted the position of second vice-president of the McFarlan Motor Corp., of Connersville, Ind.

Lautzenhiser With Lehigh Co.

F. B. Lautzenhiser, formerly chief inspector and service manager of the Service Motors Corp., Wabash, Ind., has become affiliated with the Lehigh Co., Allentown, Pa., in the capacity of assistant sales manager. Previous to going with the Service Motors Corp., in 1922, Mr. Lautzenhiser was for a number of years connected with the International Harvester Co. at both the Akron factory and the Charlotte, N. C., branch.

Dewar Traffic Manager

John D. Mansfield, president and general manager of the Chrysler Corp. of Canada, Ltd., Windsor, Ont., announces the appointment of Alex Dewar as traffic manager. Mr. Dewar joined the Gray-Dort Motors at Chatham in 1916 as traffic manager, and has been connected with the industry continuously since.

Smith and Jackson Buy Truck Co.

C. C. Smith, president, and T. G. Jackson, vice-president and sales manager of the Master Motor Truck Co., Chicago, have bought out the interests of Henry Moses and M. Levinsohn in that company. Messrs. Smith and Jackson are now sole owners of the Master Motor Truck Co. and of the organization which formerly sold parts for these trucks.

Fisher Joins Central Committee

Secretary of Commerce Hoover has advised John H. Kirby of Houston, Tex., chairman of the Central Committee on Lumber Standards, that Charles T. Fisher, vice-president of the Fisher Body Corp., has accepted an invitation to serve as a member of the Central Committee. Mr. Fisher has had many years of experience in handling lumber, especially hardwoods, and is, therefore, well qualified to serve the industry in the development of the hardwood standardization program. His knowledge of softwoods will likewise be helpful to the committee in its consideration of the important studies now being conducted in that field.

Mr. Fisher's acceptance completes the reorganization of the Central Committee, which Secretary Hoover initiated some time ago.

Warfield and Kramer Resign

E. E. Warfield, vice-president in charge of sales of the Gill Mfg. Co. for the last four years, and Geo. A. Kramer, advertising and assistant sales manager for the last two and a half years, have resigned their positions with the company. Their future plans have not been announced.

Herron is Sales Director

Milo J. Herron has been appointed sales director in Canada for Dodge Bros., Inc., and will have his headquarters in Toronto. Mr. Herron has been in Toronto since the opening of the Dodge factory there, and has charge of the Graham Bros. division.

Fritsche With W. B. Wilde

J. H. Fritsche, assistant factory manager of the Peerless Motor Car Co., Cleveland, for a number of years, has resigned and accepted a position as assistant sales manager for the W. B. Wilde Co., Peoria, Ill., manufacturer of Hart oil burners. W. H. Fraser, formerly with Peerless, is general sales manager for the Wilde Co.

Company Changes Name

GRAND RAPIDS, MICH., Dec. 9—The Doerr Mfg. Co. has changed its name, to take effect at once, to the Grand Rapids Metalcraft Corp.

The company is a manufacturer of ash trays, cigarette cases and vanity cases in metal for closed cars, and is now in production on metal door trim panels and instrument boards, in mahogany, walnut and ebony finish. Officials of the company recently stated that the factory output has been doubled to take care of increased business. Plans have been approved for an addition to the factory in the near future.

Foreign Car Makers Adopt Our Ideas

Unification and Simplification of Chassis Lines Sought, Knudsen Reports

NEW YORK, Dec. 10—European automobile manufacturers are following the lead of American engineers and body designers, according to W. S. Knudsen, president of the Chevrolet Motor Co., who recently spent six weeks abroad. Mr. Knudsen's tour of Europe included visits to several automobile shows.

"It is very evident that the English, French and Italian automobile manufacturers are intensely alive to American progress in modification and simplification of chassis lines," he said. "It is also evident that during the last few years they have followed American initiative in the improvement of automobile bodies, both as to comfort and appearance. In fact, one of the largest automobile makers procures from the United States all of the tools and machinery used in building the bodies for his cars.

"Bug" Type Car Losing Favor

"The very small 'bug' type of car, apparently, is losing favor in Europe. A great majority of the light automobiles made in Europe today are modeled as closely as possible to match the seating capacity of American light cars." Mr. Knudsen inspected the European Chevrolet assembling plants at London, Copenhagen and Antwerp and the Chevrolet receiving plant at Hamburg.

"Despite the fact that the oldest of Chevrolet's European establishments have been in operation less than two years, Chevrolet sales there during 1925 will total about 20,000 cars," Mr. Knudsen said. "The growing foreign popularity of the Chevrolet will require an increase of 100 per cent in our European assembling facilities within the next two years."

Wolseley Prices Reduced Again

LONDON, Nov. 24 *(by mail)*—Despite appreciable reductions made in September, the prices of the 11-22 hp. Wolseley light sedans have again been cut.

The fabric model is now £290 instead of £325 (£375 before September), while the aluminum panelled type, introduced in September, is £300 instead of £340. Front brakes are offered for £10 extra instead of £12. 10. 0.

Auto-Gyro Machines Have Air-Cooled Engines

LONDON, Nov. 25 *(by mail)*—It is stated here today that orders are being placed by the British Air Ministry for the construction in England of four or five auto-gyro machines of the type recently tested and demonstrated by Capt. F. T. Courtney on behalf of the Ministry.

In the experimental machine, a converted Avro, an early rotary engine was used—not the most suitable type for this kind of work—but the new machines are to be fitted with air-cooled radial engines of varying horse-power, up to 400 hp., in all probability. This will enable a thorough test to be made of the design and a useful comparison to be made with the performance of the normal type of airplane.

Weymann Co. Will Have British Branch

PARIS, Nov. 24 *(by mail)*—To further the development of the Weymann silent body in Great Britain, the C. T. Weymann Co. of Paris is about to establish a branch in England and to operate its own factory in London. The English organization will produce custom bodies, create body styles and conduct an educational campaign.

"While British automobile manufacturers are generally convinced of the special advantages of the Weymann fabric leather silent body," states C. T. Weymann, "they feel that there is a lot of educative work to be done among users, and we are now prepared to do this work."

Four-Cylinder Voisin Takes 5 World's Records

PARIS, Nov. 24 *(by mail)*—A four-cylinder Knight type sleeve-valve Voisin of 242 cubic inches this week took five world's records away from the 45 hp. poppet valve Renault of 556 inches piston displacement, on the Montlhery track.

The Voisin covered 500 kilometers in 2 hrs. 53 min. 46 73/100 sec., or 2 min. 54 sec. better than the previous record. In three hours the distance was 321.76 miles, compared with 316.67 miles. For 500 miles the record was 4 hrs. 41 min. 26 22/100 sec., or 7 min. 45 sec. faster than the Renault. One thousand kilometers were covered in 5 hrs. 48 min. 54 63/100 sec., and in six hours the Voisin totalled 635.21 miles, compared with 602 for the Renault.

French Car Prices Are on the Up-Grade

PARIS, Nov. 25 *(by mail)* — By reason of the depreciation of currency, automobile prices are on the upgrade in the French market.

The Talbot Co. has increased all prices 10 per cent; Unic has added 2,000 francs to the price of all chassis; Citroen has increased the price of his 5 hp. model 1,500 francs, the larger model remaining unchanged. Up to the present, Renault has made no change, but an increase is expected. These higher prices are in addition to the extras for tires.

Increased prices have been accompanied by increased demand and production, the explanation evidently being that, in view of the unsettled financial state of the country, the public prefers to hold goods rather than currency.

N. A. C. C. Decries Hotel Exhibits

Distract Attention From Shows and May Have Serious Effect on Displays

NEW YORK, Dec. 5—Directors of the N. A. C. C. have adopted resolutions denouncing the practice of making exhibits of parts and accessories at hotel rooms during the National Automobile Shows in New York and Chicago as antagonistic and a menace to the shows.

"These exhibits in hotel rooms," say the directors, "are designed to take advantage of the shows without contributing anything to their well-being, and are, therefore, unworthy members of the industry.

"They are an attempt to transact, at other places, business for which, in part, the shows are promoted.

"They are an attempt to distract the attention of factory representatives whose business requires their attendance regularly at the shows.

A Menace to Shows' Success

"They will, if continued, have a serious effect on the display of parts and accessories and are, therefore, a menace to the success of events which have for twenty-five years played an important part in the upbuilding of the industry. They are disloyal to the car manufacturer who properly expects his efforts in connection with the shows to be supported by a display of the component parts of his car.

"The directors believe, further, that the cultivation of more intimate acquaintance between members of the industry is essential to the continued success of the National shows.

"They, therefore, urge:

"1. That hotel displays be discontinued.

"2. That, if any are continued, all members of the association, their officers, heads of departments and dealers refrain from visiting them and use all proper means to discourage them.

"3. That members of the association, their officers, heads of departments and dealers visit and take advantage of the comparative quietude of the Trade Sessions (Monday and Tuesday, from 10 o'clock in each case) to inspect the offerings of the parts and accessories maker and improve their acquaintance with each other and members of the industry generally."

Canada Makes 1,000,000 Cars

TORONTO, ONT., Dec. 9—"Facts and Figures of the Automobile Industry in Canada," recently published by Automotive Industries of Canada, the trade association of manufacturers of motor vehicles, tires, parts and accessories, calls attention to the fact that to date approximately 1,000,000 motor vehicles have been manufactured in Canada.

More than 100,000 Canadians are now employed in the industry.

Coming Events

SHOWS

Dec. 7-20 — Buenos Aires, 8th Annual Argentine Automobile Show.

Jan. 9-16—New York, N.A.C.C. National Annual Show, Grand Central Palace.

Jan. 18-23—New York, Twelfth National Motorcycle, Bicycle and Accessory Show, New Madison Square Garden.

Jan. 22-30—National Motor Boat Show, Grand Central Palace, New York.

Jan. 30-Feb. 6 — Chicago N.A.C.C. National Annual Show, Coliseum.

Jan. 30-Feb. 6—Chicago, Automobile Salon, Hotel Drake.

Feb. 13-Mar. 15 — International Automobile Show, Copenhagen, Denmark.

NATIONAL SHOW WEEK EVENTS

Jan. 11—Atlantic District, National Automotive Dealers Association, East Ballroom, Hotel Commodore, 10 A. M.-5 P. M.

Jan. 11—Rubber Association of America, Inc. Banquet and Meeting, Hotel Commodore.

Jan. 11 — N. A. C. C. Headquarters, Motor Truck Manufacturers Meeting.

Jan. 12 — National Automobile Chamber of Commerce Dinner, Hotel Commodore, 6.30 P. M.

Jan. 13—M. & A. M. A. Annual Dinner, Hotel Astor, 6.30 P. M.

Jan. 13 — Franklin Dealers Luncheon, Hotel Commodore, 1 P. M.

CONVENTIONS

Jan. 11—Rubber Association of America, Inc., Meeting, Hotel Commodore.

Jan. 11-13—New York, Second World Motor Transport Congress, Roosevelt Hotel.

Jan. 11—Chicago, Ninth Annual National Automobile Dealers Association, La Salle Hotel.

Jan. 11-15—Good Roads Convention and Exposition, Chicago, Coliseum.

Jan. 21-22—Hotel Statler, Buffalo, N. Y., Winter Sectional Meeting, American Society for Steel Treating.

Feb. 2-3—Congress Hotel, Chicago, Automotive Electric Service Association.

S.A.E. MEETINGS

National

Jan. 14 — New York, Annual Dinner, Hotel Astor.

Jan. 26-29 — Detroit, Annual Meeting.

Sectional

Dec. 14—Cleveland. Hotel Hollenden. Dinner 6.30 P. M.

Dec. 15—Buffalo. Hotel Statler. 8 P. M.

Dec. 16 — Dayton. Engineers Club. Evening.

Dec. 17—Detroit. General Motors Bldg. Evening.

Dec. 18 — Chicago Engineers Club. Dinner 6.30 P. M.

Dec. 29 — Northern California Engineers Club, San Francisco. Dinner 6.30 P. M.

Coming Feature Issues of Chilton Class Journal Publications

January 1—Automobile Trade Journal —National Shows Number.

January 7—Motor Age — National Shows Number.

January 14—Motor World Wholesale— New York Show Report.

February 4—Motor Age — Chicago Show Number.

February 4—Motor World Wholesale —Chicago Show Report.

February 18—Automotive Industries— Statistical Issue.

Belgian Car Show Has 92 Exhibitors

BRUSSELS, BELGIUM, Dec. 8—The Nineteenth Annual Belgian Automobile Show opened Saturday with 750 exhibitors of all classes, a record number, comprising 92 passenger car manufacturers, of which 40 were French, 28 American, 13 Belgian, 9 Italian and 2 Austrian. This show is the only international exhibit on the continent this year admitting all but German exhibitors.

The Berlin show, which closed four days after the Brussels show opened barred all foreign makes of cars and was marked by a strong anti-foreign publicity campaign. The feature of the Brussels show is the strong commercial competition between American and French makers, both striving hard for the Belgian market.

Citroen Reduces Price

Citroen announced reduced prices on the opening day, but, as French prices recently increased, it is believed that this is only a temporary move and that prices will rise again at the close of the exhibition. One Citroen model is offered for the first time, with four-wheel brakes at an extra cost of 1,600 francs. However, there were few new models and not many mechanical changes.

Delaunay-Belleville produced a new 2-litre overhead valve chassis, with Perrot front and transmission brakes. French B.N.C. has a new sport model. Nagant has a new 6-cylinder 3-litre overhead valve chassis on the same lines as the previous four. The Vagova small six has positive valve-closing mechanism, but all others have confined themselves to detail changes. Every European car in the show has front brakes, the Perrot type dominating. DeWandre vacuum servo-mechanism is extensively adopted, among those using it being Minerva, Nagant, Excelsior, Isotta Fraschini, Voisin, etc.

Some smaller Belgian firms are feeling foreign competition strongly and are abandoning passenger car manufacture in favor of trucks, in which field there is comparatively little competition, except from the Ford Co.

Closed Cars Stronger

The closed-car situation is immensely strengthened, the indications being that the open type will eventually become confined to sports models. Metallurgique offers an open car at 42,000 francs and a sedan for only 3,000 francs more.

Pyroxylin finishes are being used by Nopab. Under American influence, balloon tires are enormously developed, even Michelin, the European opponent of balloons, building them for Belgian cars. Marelli has produced a new magneto, which gives four sparks per revolution.

First British Grand Prix Race Aug. 2

LONDON, Nov. 15 (*by mail*)—One of the important automobile fixtures of 1926 is the British Grand Prix, to be run over a course of 300 miles at Brooklands on Aug. 2.

This will mark the first occasion on which a British track has been utilized for an event of first class international importance and will be ranked with the other four Grand Prix races in France, Italy, Belgium and the United States. Participation in these will count towards the winning of world's championships.

Hardwood Sales Unusually Good

ATLANTA, Dec. 9—Lumber manufacturers in the Atlanta and other principal lumber markets of the Southeast advise that hardwood sales to the automobile, body and implement makers in the last three or four weeks have shown scarcely any decline, in spite of the lateness of the year, and that sales in the last quarter of the year seem certain to establish one of the best records in the history of the business for this period.

The principal demand is for white ash, maple and elm in the thicker dimensions, and for hickory. There is also some demand reported for gum woods, though the latter is very short in supply, and prices are $10 to $12 higher than those prevailing a month ago.

Most of the buying by automobile and body makers, however, is conservative, and for immediate wants. Inquiries, however, are good for shipments in the early part of next year, in sufficiently heavy quantity to indicate that business in the first quarter of 1926 will likely establish the largest early year sales to date.

Prices are generally stable, ash holding to the advance in price noted several weeks ago, other woods comparatively unchanged.

Indianapolis Race May 31

INDIANAPOLIS, Dec. 10—The Indianapolis Motor Speedway today announced its next 500-mile race will be run Monday, May 31, 1926, following the custom of the company in always setting the Memorial Day Race the day after the 30th when the holiday fall on Sunday.

AUTOMOTIVE INDUSTRIES

VOLUME 53 *Philadelphia, Thursday, December 17, 1925* NUMBER 25

Truck Makers *to* Get Big Slice *of* 1926 Prosperity

Sales next year likely to exceed record volume of 1925. Replacement and export markets growing. Surplus war stocks passing. Prices holding up.

By Norman G. Shidle

MOTOR truck production reached a new peak this year. It seems likely to climb to even greater heights in 1926. With the passenger car phase of the industry reaching its point of stabilization, the truck business probably is just about set for its best period of growth. Long-swing influences and immediate market considerations combine at this time to make truck prospects for 1926 particularly bright, despite the presence in the truck field of several acute merchandising difficulties.

The favorable aspects which will tend to make 1926 a big truck year may be summarized as follows:

1. General business conditions are sound and give every evidence of continuing so through the next twelve months.

2. Improvement in knowledge of how to sell commercial vehicles is speeding the educational process of selling the motor truck idea. Successful manufacturers are studying markets more intelligently and more carefully than ever before.

3. There is less excess production capacity in the truck industry probably than at any time since the war. The gap between capacity and demand is narrowing rather than widening.

4. With more than 2,500,000 trucks and buses in use in the United States and some 800,000 in foreign countries, the replacement market in 1926 will be larger than in previous years; large enough to be a really important factor in demand.

5. Bus development has continued at a rapid rate throughout 1925. Reports from the field indicate that 1926 will record another substantial increase in bus use.

6. The export market probably will absorb more American-built trucks in 1926 than ever before.

General business conditions, of course, are by far the most important of the items listed so far as 1926 truck sales and profits are concerned. But the underlying effects of the other factors seem certain to be strong during the next twelve months.

The state of business and industry in general is recognized as affecting strongly the prospects for any automotive line, but no other automotive product probably is so

How the Manufacturers Themselves Feel About It—

IN order to find out how the truck manufacturers themselves feel about the business situation in 1926, *Automotive Industries* queried a number of well-known executives at the time the accompanying article was written. They were asked to comment briefly on the outlook.

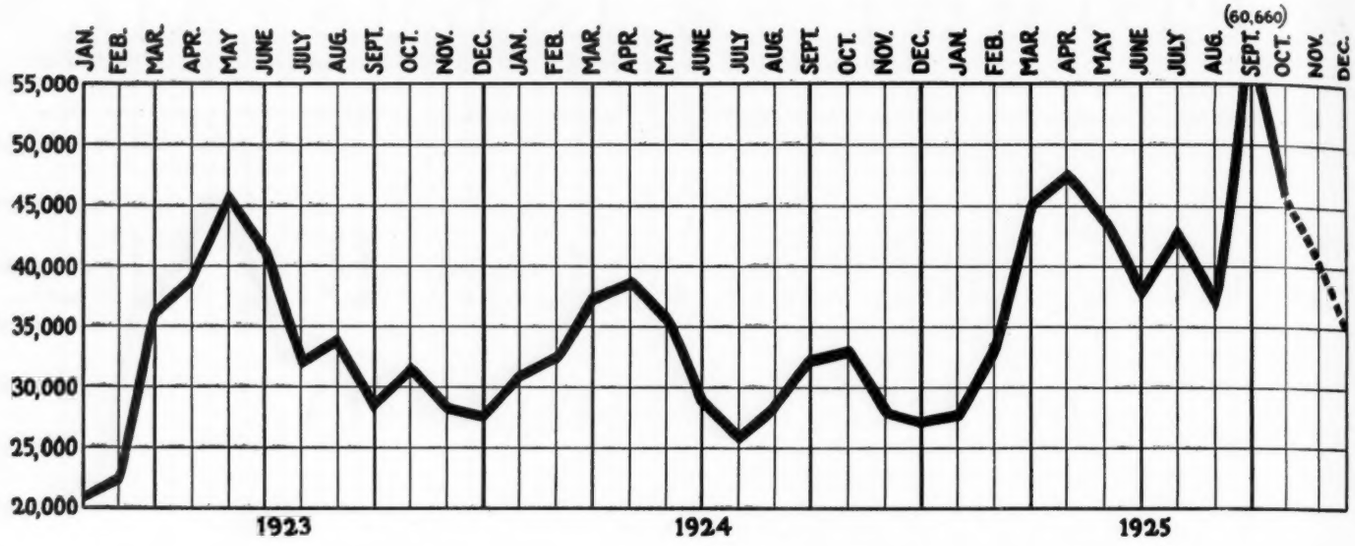
"Particularly promising; we look for unprecedented demand," one replied.

"With prosperity increasing daily, the demand for new equipment should bring exceptionally good business," said another.

"Business now in hand," another stated, "insures larger volume in January and February than in corresponding months of 1925."

This optimism was expressed all along the line. **Read the comments on page 1010.**

Truck Production by Months, 1923-24-25



closely allied with this factor as is the truck. Ever since the war, of course, truck sales have been hindered to some extent by competition from surplus war stocks, by trade practices engendered directly as a result of the over capacity for production built up at that time to fill an emergency, and by other similar factors peculiar to the truck industry itself.

But under anything like normal conditions, truck sales and profits of truck manufacturers may be expected to follow rather closely the trend of general industrial and agricultural conditions. And in 1926, the truck business will be affected less strongly than ever before by those special hindrances which have beset it ever since the end of the war. War surplus stocks have been fairly well used up and a good many of the trucks included in that group probably will be wearing out soon, thus increasing abnormally for a year of so, perhaps, the replacement market.

With general business conditions good, then, and with some of the special truck industry inhibitions removed, there is every reason to be optimistic about 1926 in the commercial car field.

Still Facing Some Difficulties

Plenty of difficulties still exist in the truck industry, to be sure, particularly in the marketing end. No true picture of 1926 possibilities can be obtained unless these soft spots be recognized frankly. Some of the more important trouble producers are:

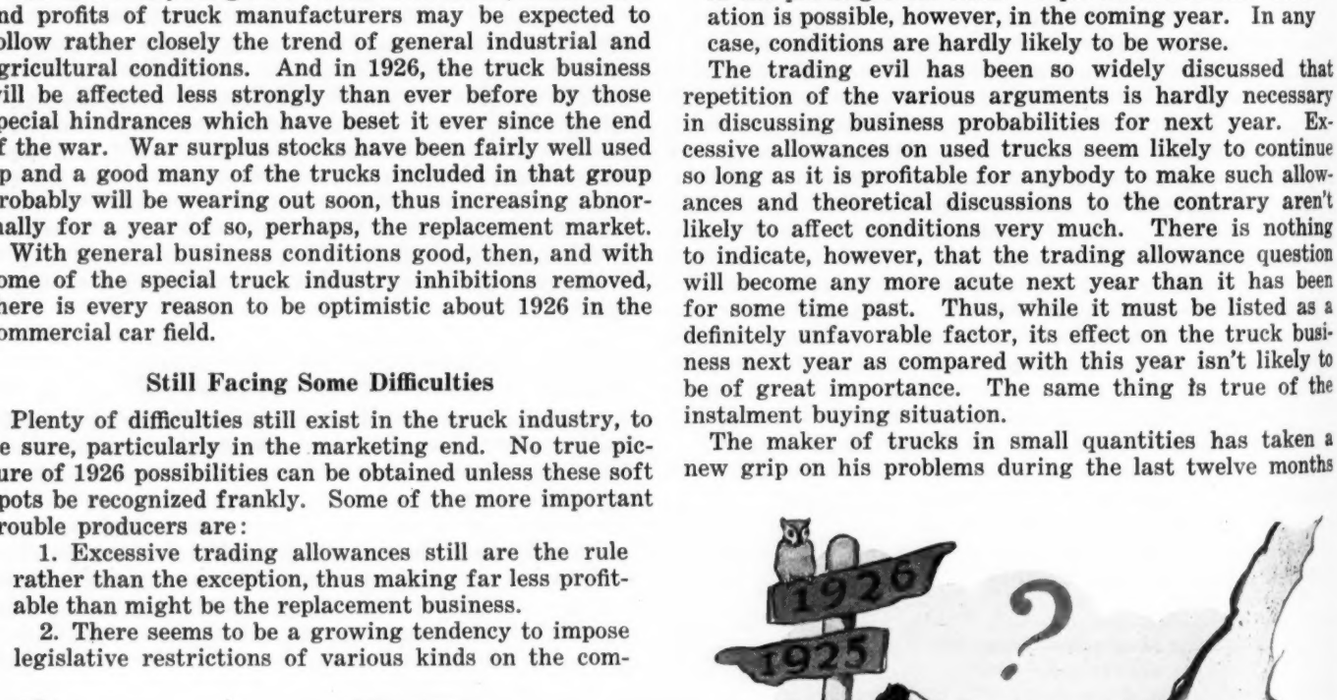
1. Excessive trading allowances still are the rule rather than the exception, thus making far less profitable than might be the replacement business.

2. There seems to be a growing tendency to impose legislative restrictions of various kinds on the commercial motor vehicle. While regulation of commercial vehicles is admitted by the industry to be desirable in many cases, there seems to be little justification for some of the restrictions imposed which tend to limit materially the economic value of the truck or bus as a transportation unit.

3. Retail financing terms are even more liberal than in the passenger car field. Improvement in this situation is possible, however, in the coming year. In any case, conditions are hardly likely to be worse.

The trading evil has been so widely discussed that repetition of the various arguments is hardly necessary in discussing business probabilities for next year. Excessive allowances on used trucks seem likely to continue so long as it is profitable for anybody to make such allowances and theoretical discussions to the contrary aren't likely to affect conditions very much. There is nothing to indicate, however, that the trading allowance question will become any more acute next year than it has been for some time past. Thus, while it must be listed as a definitely unfavorable factor, its effect on the truck business next year as compared with this year isn't likely to be of great importance. The same thing is true of the instalment buying situation.

The maker of trucks in small quantities has taken a new grip on his problems during the last twelve months



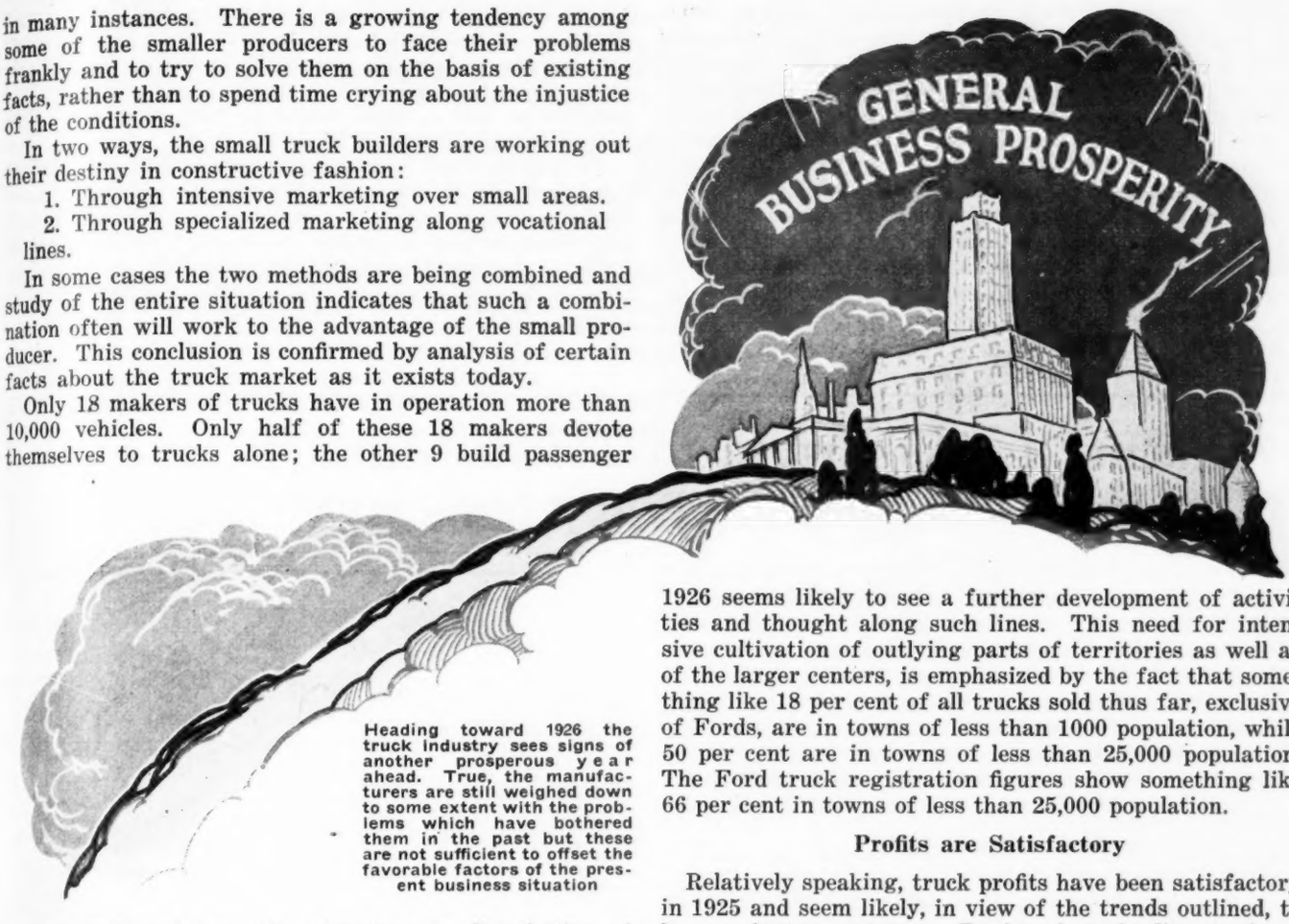
in many instances. There is a growing tendency among some of the smaller producers to face their problems frankly and to try to solve them on the basis of existing facts, rather than to spend time crying about the injustice of the conditions.

In two ways, the small truck builders are working out their destiny in constructive fashion:

1. Through intensive marketing over small areas.
2. Through specialized marketing along vocational lines.

In some cases the two methods are being combined and study of the entire situation indicates that such a combination often will work to the advantage of the small producer. This conclusion is confirmed by analysis of certain facts about the truck market as it exists today.

Only 18 makers of trucks have in operation more than 10,000 vehicles. Only half of these 18 makers devote themselves to trucks alone; the other 9 build passenger cars as well and have the advantage in distribution of already established dealer outlets in various parts of the country. This factor is not to be disregarded, despite the growing belief that the passenger car dealer, to be a successful truck merchant must have a special department and special salesmen to handle the commercial car end of his business.



Heading toward 1926 the truck industry sees signs of another prosperous year ahead. True, the manufacturers are still weighed down to some extent with the problems which have bothered them in the past but these are not sufficient to offset the favorable factors of the present business situation

Numerous examples are still to be found of truck makers, the total registration of whose products is less than 2,000, who are striving for national distribution. At least 17 of these appear in an analysis just completed, which merely sampled the field. Out of these 17, four makes showed total registrations of less than 1000, while two of the group have less than 700. The cost of selling and of providing adequate service over very wide areas on a volume as small as this undoubtedly is expensive, while competition at points far from the factory is difficult if not impossible to meet when the competitor has adequate local representation and the small producer has not.

Thinking in Right Direction

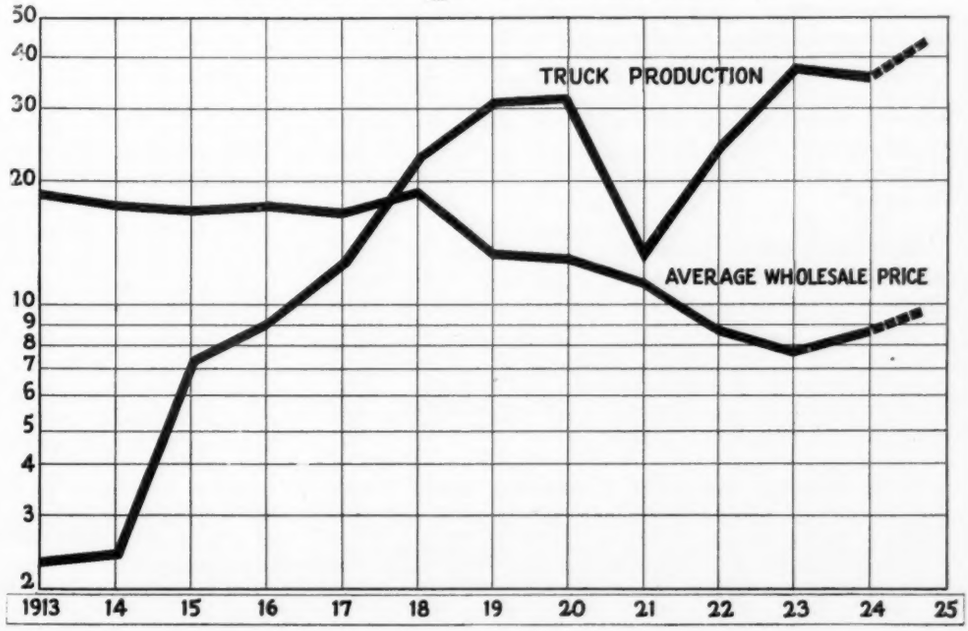
While the whole problem is far from being as simple as might be indicated by the foregoing paragraphs, a number of the smaller makers are known to be thinking along these lines and 1926 seems likely to see a further development of activities and thought along such lines. This need for intensive cultivation of outlying parts of territories as well as of the larger centers, is emphasized by the fact that something like 18 per cent of all trucks sold thus far, exclusive of Fords, are in towns of less than 1000 population, while 50 per cent are in towns of less than 25,000 population. The Ford truck registration figures show something like 66 per cent in towns of less than 25,000 population.

Profits are Satisfactory

Relatively speaking, truck profits have been satisfactory in 1925 and seem likely, in view of the trends outlined, to be even better next year. Profits of one leading producer increased by a little over 50 per cent for the first nine months of 1925 over the first nine months of 1924, while increases of less magnitude have been recorded by a number of commercial vehicle builders.

The trend of prices, so far as it can be determined in the truck field, seems favorable to a continuance and perhaps an increase in profits next year. A study of the

Relative Trends of Truck Production and Average Wholesale Price



relative trends of truck production and average truck wholesale prices since 1913, shows the average wholesale price moving up in 1924 and 1925 for the first time after having declined steadily ever since the war. The upward trend in average wholesale value must be attributed to one of two things; either it is the result in an average increase in prices or it is the result of larger, more expensive trucks constituting a greater proportion of total sales.

Both of these factors appear to have influenced the curve in the last two years, the latter being apparent from a study of the detailed figures on truck production by tonnage classes. This year, for example, not only have truck sales as a whole showed an increase which will total somewhere between 28 and 33 per cent above 1923, but analysis shows the increases to have been distributed through every tonnage group. The 1½ ton models have done particularly well, while heavier sizes in practically every case had reached as high a total output in nine months of 1925 and in the whole year of 1924.

Predicting truck output for 1926 is at best a hazardous procedure, but on the basis of the trends which now seem likely to operate during the next twelve months, 1926 output seems certain to exceed the record-breaking total of 1925. A conservative guess might put 1926 truck production at 550,000, while more optimistic estimates run as high as 575,000.

Future Looks Bright to Truck Manufacturers; What They Say About 1926

PROMINENT truck manufacturers are practically a unit in their view of 1926 motor truck business. In special communications to *Automotive Industries* a number of them have pointed out their reasons for optimism. Most of them confirm the idea expressed in earlier paragraphs that good commercial vehicle business depends primarily on the soundness of the whole structure of industry and point to the growing realization that the truck is an economic transportation necessity as additional reason for looking to 1926 with confidence.

It is evident also from the views expressed by some of these executives that greater emphasis is likely next year on constructive and intelligent sales practices and on improvement in service methods and facilities.

A. J. Brosseau, president, Mack Trucks, Inc., sees next year's truck business as likely to be infiuenced by international as well as national considerations. "If political and economic conditions in Europe continue to improve," he says; "If Congress follows the recommendations in the very able message of President Coolidge; and if the manufacturers and business men continue to follow a policy of not overstocking or speculating in commodities—thus refraining from promotion of a disastrous boom—general business during 1926 will be good. There is now quite general acceptance as to the place of the motor truck in industry and it follows that if general business is good and if there is a large turnover of merchandise, the use of the truck will be in direct proportion to the general prosperity of the country—which means that the truck business will be good."

David S. Ludlum, president, The Autocar Co., also sees the motor truck future as bright. He says: "Present indications would warrant a forecast that during the year 1926 there will be an increasing demand for high-grade, dependable commercial motor vehicle transportation equipment." Mr. Ludlum emphasizes also the growing economic importance of the motor truck.

W. R. Bassick, president, Commerce Motor Truck Co., says that "with general business prosperous, the outlook for the motor truck industry in 1926 is particularly promising," and states that "we look for an unprecedented demand for those trucks which adequately meet the public need."

B. A. Gramm, president, Gramm & Kinkaid Motors, Inc., points to the wearing out of surplus war stocks of trucks as one favorable aspect of the present situation and adds that "with prosperity increasing daily the demand for new equipment should bring exceptionally good business to motor truck builders and dealers, especially those who study the transportation needs of their customers' businesses, giving them correct capacity values and economic service."

J. W. Stephenson, president, Indiana Truck Corp., predicts a big year in 1926, stating that "business now in hand insures larger volume in January and February than in corresponding months of 1925." He adds that "conditions in the industry from our viewpoint are excellent; and considering satisfactory state of general business and vast construction and building program for 1926 we feel that it will be a banner year."

Walter C. White, president, White Motor Co., says "Our belief in business for 1926 is such that we are preparing increased facilities in all departments in order that we will be able to meet all market requirements and better serve our customers."

O. W. Hayes, president, Republic Motor Truck Co., Inc., sees on every hand the signs of one of the most prosperous years in the history of the truck industry. "I cannot look upon 1926 with anything other than the greatest optimism," he says. Among the favorable factors he enumerates are: The "sound, sensible basis" on which the truck industry has been operating for the past several years; pending tax reductions; the more favorable attitude of the railroads toward motor transport; the great development in bus operation; continuation of the nation's comprehensive road building program, and the improved financial status of the American farmer.

These expressions, coming as they do from producers of varying size and point of view, can be taken as typical of a general sentiment: The year 1926 looks good from a truck angle.

Rickenbacker Enters Aircraft Field With 75 Hp. Radial Engine

Said to be first motor developed here especially for private operators without regard to Government specifications. Weighs about 2.4 lb. per hp. fully equipped. Dependability a feature.

By Leslie S. Gillette

IN a few weeks the aircraft industry will be offered what is said to be the first engine specifically developed for private operators and without regard to Government requirements and the limitations of Government specifications. After an extended period of study and tests, the Rickenbacker Motor Co. announces a 60-80 hp. engine for which it is claimed that it is as reliable and durable as an automobile engine, economical to operate, can be easily overhauled in a few hours' time and will sell at a popular price.

Rickenbacker's new engine, to be known as the Beaver, is a fixed radial air-cooled unit of five cylinders developing 75 hp. on the brake at 2,400 r.p.m. Fully equipped and ready for installation it weighs 180 lb. or approximately 2.4 lb. per hp. The weight-horsepower ratio is not out of the ordinary, as the engine is designed for reliability rather than light weight.

Having an outside diameter of only 30 in. and short overall dimensions, and forming a self-contained air-cooled unit, the Beaver engine is adaptable to a wide range of applications and several methods of installation. A single seater fitted with it should be capable of 125 m.p.h.; a two seater commercial or training plane would have a useful range of several hundred miles, and the engine could also be mounted in multiples of three in a cabin cruiser permitting 8 passengers and their luggage to be carried.

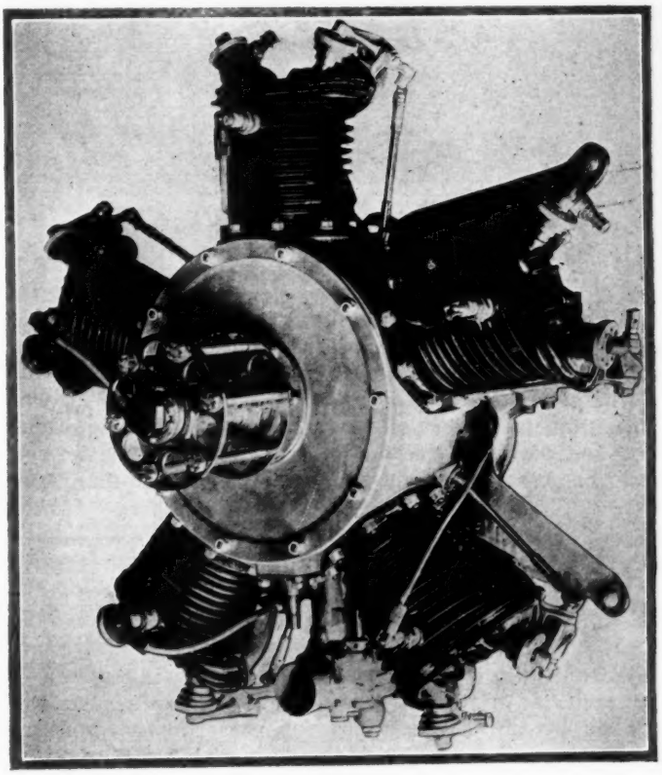
Piston Displacement 220 Cu. In.

Capt. E. V. Rickenbacker, in collaboration with Glenn D. Angle, chief engineer of the aircraft engine division of the company, designed the new power plant. The bore is 4 in. and the stroke 3½ in., giving a piston displacement of 220 cu. in. The normal operating speed of the engine is 1,620 r.p.m., at which speed it develops 60 hp.

The cylinders are of nickel iron and have integral circumferential cooling fins. They are given a black enamel finish to increase radiation. By means of a flange near their base they are bolted to the one piece barrel-shaped aluminum crankcase. At the rear of the case there is a cored inlet manifold passage from which pipes lead to the inlet valve openings in the cylinders.

The single inlet and exhaust valves in the cylinder head are inclined to the cylinder axis to improve the cooling. They are held close by volute springs made from flat wire and are operated through duralumin push rods by rockers supported on the valve port flanges. These flanges, with the rocker arms attached, may be removed as a unit. Tappet clearance adjustment is made at the outer ends of the rods. Lubrication of the rocker bearings is by pressure gun grease nipples.

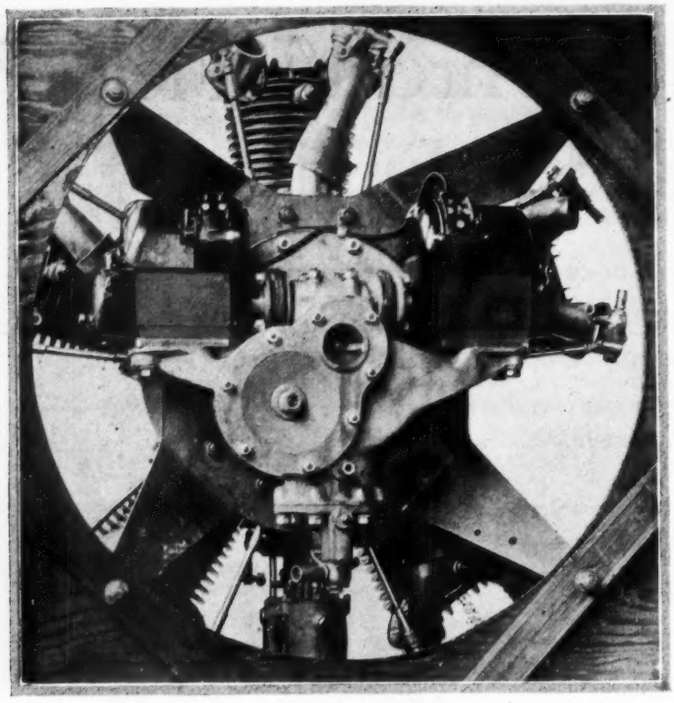
The crankcase has one transverse wall containing the boss for supporting the rear crankshaft bearing. Bosses cast on the rear side of this wall receive the guides for the cam followers.



Three-quarter front view of the new 60-80 hp. Rickenbacker aircraft engine. By removing the front cover plate seen in the photo, the crankshaft and connecting rods can be withdrawn in unit after the five cylinders have been removed

In the front of the crankcase there is a large opening which allows the crankshaft and connecting rods to be inserted as a unit, which permits of the connecting rods and counter weights of the crankshaft being fitted before final assembly. The plate carrying the ball bearing taking the propeller thrust is bolted to the front of the case covering the opening.

The crankshaft of course is of the single throw type and carries a counter weight on each arm. It is drop-forged from alloy steel and weighs slightly over ten pounds. Of the two ball bearings supporting the crank, the forward one takes the propeller thrust, as stated. The propeller hub is secured by taper, key and nut. At the rear is a driving slot receiving the shaft which operates the cam



View taken from the rear shows the method of installing the engine in a plane. The drive to the magnetos should be noted

and accessories. An aluminum gear case attached to the rear of the crankcase supports the oil pump and cam ring, including their driving gears.

Another unusual feature is the use of a single ring with three cams to operate all ten valves. It simplifies production and makes it easy to time the valves after the rear cover has been removed. This gear case, which may be removed and replaced without disturbing the valve timing, also carries an attachment for the tachometer drive.

The connecting rods, which are of drop-forged duralumin, are of the articulated type, there being one master rod, for the top cylinder which has a full bearing on the crank-pin, and has the remaining four connecting rods articulated to it. The master rod and cap are held together by four bolts which also locate and secure the pins supporting the inner ends of the linked rods. Babbitt is poured directly into the master rod and cap, whereby the heat dissipating qualities of the bearing are improved.

Aluminum alloy pistons are used, with cooling ribs under the head. There are three rings on each piston, the lower one acting as an oil control ring. The piston pin floats. Pistons are assembled after the crankshaft and connecting rods are located in the crankshaft, but prior to the attachment of the cylinders.

Ignition is provided for by two Scintilla five cylinder magnetos carried on flanges formed integral with the gearcase. The drive is through shock-absorbing couplings and the two magnetos work independently, one firing the spark plug located in the front of the cylinders and the other a plug in the rear.

From an oil pump driven through a pair of gears oil is distributed to the bearings in the gear case and to the crank pin bearing under full pressure. An oil plug in the hollow crank pin prevents any foreign matter from entering the bearing. Oil pressure may be varied up to 100 lb. if desired, by varying the setting of the relief valve spring. An extra pair of gears in the pump forces the excess oil to an outside tank. By extending the cylinders into the crankcase an oil sump is formed between the two lower cylinders which prevents the excess oil from draining into these cylinders before being returned to the tank by the scavenging pump. Oil sprayed from the bearings and moving parts is employed to lubricate the gears, pistons and ball bearings on the crankshaft.

England Prescribes Difficult Tests for Airplane Engines

PROGRESS in the design of aircraft engines is reflected by the increasing severity of the tests prescribed by the Air Services for accepting new designs and for application to engines in regular production. Revised test regulations have been issued recently by the British Air Service.

The test plant employed must be capable of allowing variation of the brake torque without stopping the engine, of measurement of the brake horsepower developed by means of the torque reaction of either the brake or the engine, and of allowing adequate cooling of the latter. In the case of water-cooled engines, arrangements must be made such that the outlet temperature of the cylinder jacket water can be regulated and maintained steady at not less than 70 deg. C. when measured close up to the engine.

In the case of air-cooled engines, the arrangement must be such that there is an air speed not exceeding 120 miles per hour in the region of the cylinder heads. All power tests, endurance and final, will be carried out at 90 per cent full power, and at normal revolutions per minute, unless otherwise specified by the Secretary of State. All engines must be opened out to full throttle, at normal revolutions per minute, for the last five minutes of all test runs, and the brake horsepower developed must not be less than the rated full power.

To ensure that engines may not be passed out for service in which there is danger of under-lubrication, a minimum as well as a maximum oil consumption is to be enforced. All fuel used for general testing must contain not less than 30 per cent and not more than 38 per cent aromatic hydrocarbons (benzoil), unless otherwise specified.

Type tests of new designs of engine comprise an endurance test of 100 hours' duration at 90 per cent full power, 50 hours of the test being carried out with the engine fitted with a propeller, the latter being suitable for the thrust tests.

At the commencement of the final hour of the test, the engine is put on full power at normal speed and for the last five minutes is opened out to full throttle. In the case of engines intended for civil aircraft, the endurance test is reduced to 50 hours. The fuel consumption must not exceed 0.54 (Imp.) pts. per brake-horsepower per hour for water-cooled engines, (0.56 pts. previously); and 0.60 pts. for air-cooled engines. The corresponding oil consumption figures are 0.025 and 0.045 pts. per brake-horsepower hour.

New engines are "run in" light for a period of not less than two hours, and after tuning up on gasoline must pass a two hours' endurance test. The engine is then stripped down completely and, if found satisfactory, a final half-hour test is given. In the case of rectification and repair engines, the running-in is reduced to one hour, the endurance test to one hour for repair, and half an hour for rectification engines; and the final test to fifteen minutes.

Parts Anywhere *in* 24 Hours Under New Willys-Overland Plan

Maintenance of 298 points of distribution insures speedy service in deliveries to dealers and garages. Provision also made to sell competing dealers. How it works.

By James C. Grant

UNDER a new method of distribution now being put into operation by Willys-Overland, Inc., it is planned that parts for any of its cars produced since the introduction of the Overland 4 and the Willys-Knight 20, may be ordered by any car dealer or independent garageman in the United States and delivery made within a maximum of 24 hours. In certain sections, such as New England, the time elapsing between order and delivery may be as little as from four to seven hours.

Although the fast service the new plan is designed to give is probably its outstanding feature, it also has two other points which are of nearly equal importance:

1. Provision for supplying competing car dealers and independents.
2. Discounts arranged so that it is possible for Overland dealers to offer an inducement to buy parts from them.

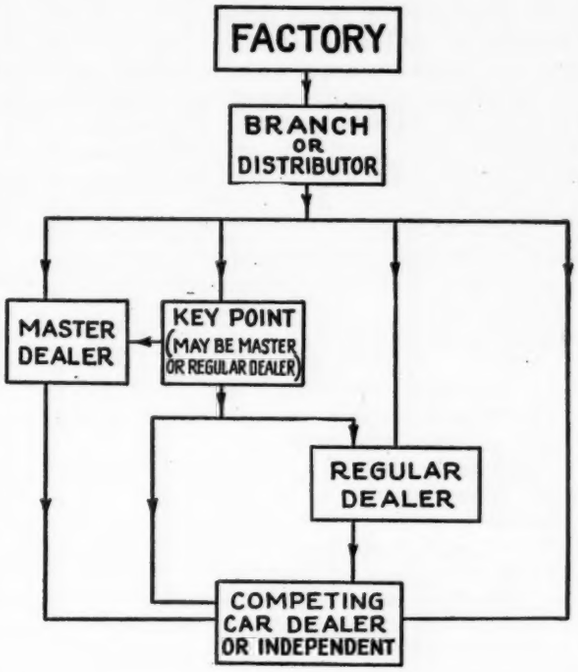
In order to provide this fast service, it has been necessary to expand the parts wholesaling organization greatly so that the source of supply will be nearer the point of consumption. To this end, 248 towns and cities, strategically located from the distribution standpoint, have been selected and, in most of them, service stocks of parts already have been established. These cities and towns are designated as key-points. Adding them to the 50 cities in which comprehensive stocks are maintained by Overland branches and distributors brings the total number of wholesale outlets up to 298.

Most of the key-points are towns of 20,000 or more, but in some cases smaller communities have been selected because they are better situated, particularly as to transportation, to serve the surrounding territories than are neighboring cities of larger population.

In order to explain the new method of distribution, it is first necessary to outline the Willys-Overland wholesale and retail organization. The wholesale function is performed in some territories by factory branches and in others by distributors. However, as far as the parts ends of the business is concerned, both operate on the same basis.

Willys-Overland Parts Distribution System

EXPLANATION: If direct dealer is appointed as key-point representative, he gets same consideration from distributor on parts as master dealer. When direct dealer buys from key-point, his discount is ten per cent less than on purchases from branch or distributor. Discount to direct dealer is, of course, less than to master and key-point dealers. Owners may buy Willys-Overland parts from branch, distributor, master, key-point, regular or competing car dealer, and also from independents



The retail function is performed by what are termed "Master Dealers" and "Direct Dealers." Both of these classes stock parts, an effort being made to keep their investment up to a minimum of $10 per car on contract. The master dealers, however, receive a larger discount on parts than do the regular dealers. The factory sells parts only to its branches and distributors which, in turn, act as sources of supply for the dealers in their respective territories. This policy has been adopted to minimize errors as the wholesaler is in a position to check up on orders received from dealers which are illegible or lacking in clearness.

Either Master or Regular Dealer

Key-point stocks may be carried either by a master or a regular dealer. Where a regular dealer is selected as a key-point representative, he receives the same consideration as the master dealer because of the larger stock he is expected to carry. The key-point dealer is not permitted to solicit parts business outside of his own territory, but he may fill any orders which he receives regardless of the address of the customer.

The sale of parts to competing dealers and independents is not limited to the key point representatives as any Overland dealer may handle this business at a discount. This is the usual procedure, the key-point stock being drawn upon only when the part required is not on hand. In the same manner, Overland dealers other than those in the key-point class, ordinarily buy parts direct from the

branch or distributor, using the key-point stocks only when fast delivery is essential. On such purchases, they receive 10 per cent less discount than on orders placed with the distributor. This differential enables the key-point dealer to gross something on this business to cover his costs.

The discount allowed to competing car dealers and garagemen is left to the discretion of the individual Overland representative who sets it in accordance with local conditions. The discount he gives to a competing car dealer usually will be made equal to that which he receives from that dealer.

Speed Primary Objective

From the foregoing, it is evident that the primary objective of the key-point stock is to speed up service—to bring the sources of parts supply nearer to the points of consumption. In his own territory, the key-point dealer handles the parts business with competing car dealers and independents in the same manner as any other Overland dealer. In addition, because the key-point stocks are more complete than those ordinarily carried by the average dealer, they serve as intermediate sources of supply from which emergency demands can be filled without delay. This emergency service is rendered to the trade not only in the key-point dealer's own territory but also in adjacent areas which are under contract to other Overland dealers.

The factory did not depend solely on its own judgment in the selection of key-points. Branch houses and distributors throughout the country were consulted and from these conferences the list was picked. Few changes in the selections have been necessary.

The key-point stocks are entablished by direct representation from the branch or distributor. A thorough investigation is made of the qualifications of each dealer for this service, and, if he comes up to requirements, he receives the appointment.

Close supervision is maintained over the key-point stocks by the factory through a corps of inspectors. These men devote their entire time to the parts end of the business, making reports on their work which keep the general parts manager at the factory of the Willys-Overland, Inc., constantly informed as to conditions in the field. If conditions are reported as unsatisfactory repeatedly at a particular key-point, pressure is applied by the factory to have the trouble remedied.

Regular Inspections a Feature

In addition, the key-point stock is inspected at least every 60 days by a representative of the branch or distributor. In some cases, these representatives devote their entire time to parts while in other territories they also are charged with service promotion work. They see that a perpetual card inventory system is kept and that a complete set of illustrated parts lists and a master price schedule are at hand. If the dealer is having trouble moving his stock or is confronted with some problem out of the ordinary, the wholesale representative studies the situation and makes suggestions, endeavoring to provide a remedy. He is also an educator passing on to the dealer any methods by which he can improve his business. Complete reports covering each visit are made to the distributor.

East of the Rocky Mountains, the distributor or branch station is required to carry a 90-day stock in his place of business. West of the Rockies, 120-day stocks are required with an order for a 30-day supply at the factory or in transit. Approximately $3,000,000 worth of parts are carried at these various stations.

The key-point dealers carry a 60-day stock, 30-days on hand and a 30-day supply on order. This reduces to a minimum the possibility of any such dealer being caught short in a rush.

The investment made by branch, distributor or key-point dealer depends on the territory, consideration being given to the number of Willys-Knight and Overland cars in operation and sales prospects in the immediate future. The assortment of parts and the number of each kind to be stocked, is determined from past records of sales in each territory.

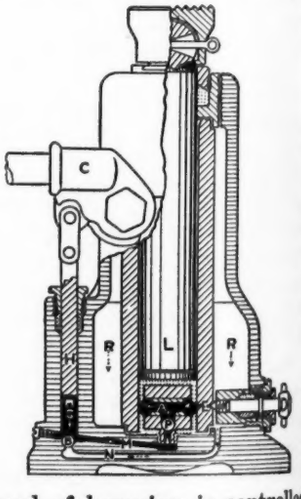
In order to protect its distributing organization further against over-stocks, provision is made for the return to the factory of parts which do not sell. With the branch or distributor, all parts not sold within 90 days may be returned and the key-point dealer has the same privilege except that the limit in his case is 60 days.

Aside from the improved service which the new plan of parts distribution has provided for Willys-Overland owners, a number of other results have been obtained. By widening the channels of distribution, factory parts sales records show an increase of over 25 per cent above last year and the increase has shown a substantial profit. Moreover, by making its possible and profitable for the competing car dealer and independent repairman to buy parts, an entirely new sales field has been opened up.

Pedersen Hydraulic Jack

A HYDRAULIC type of jack known as the Pedersen Oiljak is being placed on the market by the Oil Jack Co., Inc., New York. The device is made in 1, 3, 6 and 10 ton sizes. A sectional view of the jack is shown herewith. Referring to the illustration, by raising the handle of the jack, which fits into the socket *C*, the pump plunger *H* is raised, whereby oil is drawn from reservoir *R* through channel *N* and ball check valve *B* into chamber *G*. Lowering the handle puts the oil in chamber *G* under pressure, seats valve *B* and forces oil through channel *M* past ball check valve *P* into chamber *A*, thereby raising plunger *L* and lifting the load.

To lower the load the needle valve *D* is turned slightly which opens outlet *E* and permits oil to flow back to reservoir *R*. With this jack the load is said to be always under complete control, and the speed of lowering is controlled by needle valve *D*. Closing this valve holds the load at any point.



Pedersen Oiljak in section

To insure a firm grip under the load, the swivel head is corrugated and hardened. The ram is of solid steel, 1⅜ in. in diameter, heat-treated and ground. Adjustable oil-retaining packings prevent leakage. The rocker arm is of rigid construction and is provided with a positive stop; it swings around a heat-treated pivot bolt and projects over the pump stem, protecting it.

With Import Bars Down, German Makers Are Hard Hit by Influx of American Cars

Removal of import restrictions in Germany has caused many car factories there to curtail production programs.

THE German automobile industry suffered a severe blow by the abolition on October 1, 1925, of the system of licensing and contingenting foreign motor car importations. With the final removal of import restrictions, automobiles from other countries, particularly the United States, have been arriving at German ports in increasing volume.

The German manufacturers were in considerable distress before the restrictions were lifted. Their inability to compete successfully with American manufacturers is demonstrated in a striking manner by the figures on American car imports to Germany during the period of January 1 to October 1, 1924, and for the corresponding period of 1925, the restrictions in each case being still in force:

American Imports to Germany

Passenger Cars:	
1924	443
1925	2214
Trucks and Tractors:	
1924	106
1925	718

The figures show an increase in 1925 over 1924 of 400 per cent in passenger cars and 577 per cent in trucks and tractors.

As regards the general motor car situation in Germany at the present time the American Chamber of Commerce in Berlin has this to say:

Builders Reducing Forces

"Although business was reported as satisfactory in the spring and summer of this year, a considerable drop is observed now in the business activity so that a number of German car builders are reducing their forces. The fact that a few of the prominent manufacturers are doing very well in the face of a generally unfavorable business situation is of no great importance. The opinion prevails that the German automobile industry is facing a dark future unless sufficient credits are speedily provided and the burden of taxation is made easier.

"It has been suggested that standardization plans in the motor car industry should be accelerated, that the manufacturing methods should be simplified and brought up to modern requirements, that individual manufacturers should limit themselves to one type of car, and that they try to reduce prices by 30 per cent.

"Turnover is considerable in trucks and delivery cars; medium-size passenger cars are in demand, while those of the heavy type are very little demanded. Manufacturers of heavy motorcycles and electric cars are reporting a considerable drop in business. A better showing is reported by those making light-weight motorcycles and motorcycle delivery cars.

"Import of American cars continues, and were it not for the unfavorable general business condition, American cars would be imported in still larger numbers, especially so as the American method of selling cars on the instalment plan is being introduced. Exports of German-made cars have dropped to a minimum as compared with last year, owing to excessive prices."

Apropos of the foregoing, it is true that scarcely a day passes which does not find some German automobile or tire plant curtailing production by releasing hundreds of its employees, and in many instances preparing to shut down altogether. This predicament may be traced to the sudden drop in sales and export opportunities, to deficient local management, or to the increasingly menacing competition of the foreign, chiefly American, motor car due to the removal of the import restrictions. The German automobile manufacturer would like nothing better than that the measures which formerly limited the total number of foreign cars which might be imported, be reinstated.

According to the new commercial treaty between Germany and Italy, which is still awaiting final ratification, Italy is to receive a preferential tariff rate on motor cars. Instead of the provisional rate of duty, effective as of October 1, 1925, which amounts to 250 Reichsmarks per 100 kgs on all cars having a net weight of 2200 kgs or less, it is reported that Italy will secure the following reductions if the German-Italian commercial treaty is enforced:

Cars having a net weight of	
500 kgs or less	**250 RM per 100 kgs**
501 kgs to 900 kgs	**175 RM "**
901 kgs to 1200 kgs	**180 RM "**
***1201 kgs to 2200 kgs**	**200 RM "**

(4.20 RM equal one dollar; 2.2 English pounds equal one kilo)

*** This class embraces practically all of the American medium and heavy types of open cars.**

If the preferential rates as planned are actually applied, it will mean that also the United States must participate in the reductions, under the terms of the "most-favored-nation" agreement. It may be anticipated, however, that further "downward" tampering with the provisional rates as established on October 1, 1925, will evince a mighty protest from the German manufacturers and cause no little additional difficulty to the domestic industry, although the large group of German dealers and agents for foreign cars would gladly welcome any legislation resulting in further tariff reductions.

OF the 580,000 private automobiles registered in Great Britain less than 50,000 are owned in Scotland. Students of the British market hold the opinion that there will be an increased demand for cars in Scotland during the next few years, however, basing their conclusions largely on the fact that large sums have been appropriated for road improvements, which, when completed, will greatly increase the range of motor travel.

Bureau of Standards Builds New Brake Lining Testing Machines

Closer readings obtained with apparatus now in use. Study of linings has resulted in production of higher quality. Bureau has worked out standard test for fuels. Much work under way.

ON the occasion of a recent visit to the Bureau of Standards in Washington, an editorial representative of *Automotive Industries* found that research work is being carried on there on many subjects of interest to the industry. Most of this work is being done by the Automotive Power Plants Division, but some of the work of other Divisions also falls in the automotive field.

The tests on brake lining materials, which have been conducted at the Bureau for several years past, are being continued, and the experience gained in brake lining testing during this period has been embodied in two new testing machines recently constructed.

In making such tests it is the aim to keep the horse power absorbed constant, rather than the pressure with which the sample of brake lining material is being applied to the drum, which necessitates a change in the pressure with any variation in the friction coefficient. In the latest testing machine this change in the pressure is effected automatically. As the friction between brake and drum varies the brake will move slightly around the drum axis, and contacts are so arranged on the brake rigging that electric circuits will be closed if the deviation from the central position exceeds a certain amount.

BY carrying on scientific investigations and research work along automotive lines, the Bureau of Standards has for many years been of invaluable service to the automotive industry.

Knowing the interest that its readers have in these matters, *Automotive Industries* recently detailed a representative to visit the Bureau and write a general story on what he found going on there at present as pertaining to automotive development.

He found, among other things, brake lining tests being carried forward with improved machines; a standard test being applied to new motor fuels and dopes; studies under way relating to riding qualities, cooling solutions and superchargers for aircraft work.

These things he describes in the accompanying article.

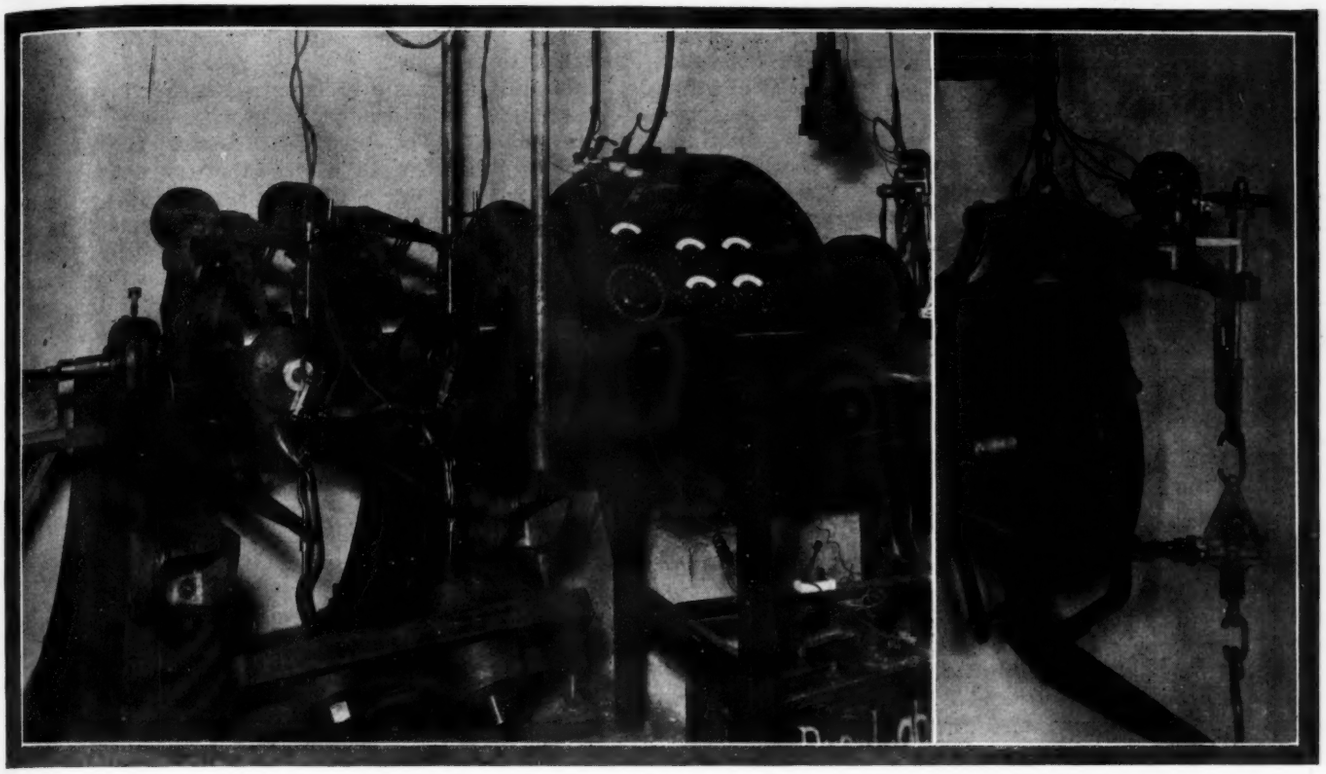
For instance, if the friction decreases, a set of contacts is closed which allows current to flow through a small electric motor, causing it to rotate in a certain direction. The shaft of the motor carries a worm which meshes with a worm wheel operating a train of mechanism by which the brake is tightened on the drum. If the friction increases another pair of contacts is closed which causes the motor to revolve in the opposite direction and the brake to be loosened slightly.

In the first machine used the friction was measured directly on a spring scale, but this proved unsatisfactory because there was insufficient damping and the indications therefore were not dead-beat. At the present time a so-called telemeter is used. The force of friction between brake and drum is taken on a steel beam. The deflection of this beam, which is in direct proportion to the force, compresses a stack of carbon disks, thereby varying the electrical resistance of the stack, which latter is in circuit with a source of current and a milli-ammeter. The indications of this meter are a direct measure of the friction, and the indications are damped much better. The telemeter referred to was developed at the Bureau and is fully described in Technologic Paper, No. 247.

It is claimed at the Bureau that the research work on brake lining which has been carried out there has resulted in a very material improvement in brake linings in general. One characteristic of brake linings found in this investigation is that the first time they reach a comparatively high temperature in severe service, the lining begins to "bleed," as it were, the saturant becoming fluid and oozing out, whereby the coefficient of friction is greatly reduced. As the service continues the excess saturant seems to burn out, and the friction coefficient increases again. This decrease in friction coefficient which naturally occurs when descending long, steep hills, involves an element of danger, and a good deal of study has been given to the problem of lessening this effect or eliminating it entirely if possible, but not much success has been achieved along this line so far.

On the other hand, the durability of brake lining material under severe service has been greatly increased. The Bureau has what it calls a severe service test, which involves the absorption of 6 hp. on a piece of lining of a standard size. When the tests were first begun, it took from 1 to 16 hours to wear down the linings from a thickness of ¼ in. to a thickness of ⅛ in., a good average lining brake from 4 to 7 hours. Today a good average lining will stand up under this test for from 40 to 50 hours, and as high a record as 200 hours has been obtained.

Owing to the fact that new fuels and fuel dopes are constantly being placed on the market and the Bureau is often



Left: The new double brake-lining testing machine with telemeters in links connecting arms of brake; also showing instrument boards with milli-ammeters connecting to the different telemeters. Right: Mechanism, comprising a small electric motor, for keeping load on brake lining testing machine constant

called upon to make tests of these, a simple standard test has been worked out which inventors and others can have made at a nominal charge. The quantities measured are (1) horsepower; (2) fuel consumption in pounds per horsepower-hour and (3) permissible power development (without preignition or detonation) with a given compression ratio. The performance of a test engine on the fuel under test is compared with the performance of the same engine on a fuel in general use, viz., gasoline. To this procedure the objection might be raised that commercial gasoline is not a definite, fixed substance, but if it is frequently compared with a suitable standard, this is a matter of little moment.

In reporting results it is stated that differences in power, fuel consumption, etc., of 5, 10, or 15 per cent have or have not been found. To detect differences of 1 or 2 per cent with certainty would require a considerably longer program of tests.

The full throttle compression pressure of the engine used in the tests is high enough to make considerable throttling necessary for satisfactory operation with gasoline as fuel. The relative amount of throttling necessary with the comparison fuel is determined.

When comparing the fuels on the basis of power and fuel consumption, the engine is further throttled to make sure that no detonation or preignition is present. In this comparison, tests with both fuels are made at the same throttle opening.

If feasible, distillation curves, chemical analyses, and measurements of corrosion are made, this information may or may not be included in the report.

Parties making application for this test must specify whether the sample is a motor fuel (to be used in place of gasoline) or a fuel dope (to be added to commercial gasoline). In the latter case the quantity normally used per gallon of gasoline must be stated.

Five gallons of fuel is required for these tests. In the case of a fuel dope, the sample must be sufficient to prepare at least 5 gal. of fuel, and must be at least equal to 4 ounces. If the material can be purchased in the open market, the Bureau may at its discretion purchase an equal amount, subject it to the above tests and include the results in its report.

Riding Comfort Studied

Some work has been done at the Bureau on the degree of discomfort induced in vehicle passengers by vibrations of various amplitudes and frequency. To this end a cushioned seat, similar to an automobile seat, was arranged to be supported on a shaft upon which an eccentric was turned, the eccentricity decreasing along the length of the shaft from the maximum to zero. As the shaft supports the seat through an eccentric strap, vibrations of any amplitude between the extremes can be produced. Moreover, the seat may be vibrated in a vertical, horizontal or any intermediate plane. Change of frequency of vibrations is produced by varying the speed of the electric motor driving the eccentric shaft.

It was found, by making tests with a considerable number of observers, that the degree of discomfort is not a direct function of the frequency of vibration. With an appreciable amplitude, at a high frequency the degree of discomfort will be very pronounced; then, as the speed is reduced the feeling of discomfort practically vanishes at a certain speed or frequency, but it reappears again at a lower speed. On the other hand, for a given frequency the degree of discomfort seems to be more or less proportional to the amplitude of the vibration.

For some years the Bureau has published a letter circular on anti-freeze solutions for use in the cooling systems of automobiles. A new edition will appear shortly and will have additional information on the properties of glycerine and related solutions with which extensive experiments have been made recently. In this connection it

is pointed out that chemically glycerine is related to alcohol; in fact, chemists refer to it as a tri-atomic alcohol and its correct chemical name is glycerol. The molecular formula of glycerine is $C_3 H_5 (OH)_3$, while that of ethyl alcohol is $C_2 H_5 OH$.

Like many other solutions, glycerine-water solutions resemble vinary alloys in that one particular concentration, known as the cryohydrate, freezes solid at a constant temperature much below the freezing point of either constituent. As a glycerine-water solution of any other concentration is cooled down freezing does not take place at a constant temperature but crystals of one of the constituents (for percentages up to 60, ice crystals) gradually separate out forming a slush as the temperature of the solution continues to drop. This slush may impede circulation but, since bursting of the container can only take place when practically the whole mass is frozen solid, considerable assurance against injury to the cooling system by freeze-ups is afforded.

Hard to Obtain as Solids

It has been found that nearly all the alcohols (including the polyatomic alcohol like glycerine) are very hard to obtain as crystalline solids. For instance, pure glycerine ordinarily solidifies to a glassy solid even when placed in liquid air and this solid has no definite melting point. However, if concentrated, glycerine is exposed to zero weather for long periods it often crystallizes. Crystalline solid glycerine has a definite melting point, which is about 66 deg. Fahr. Absolute alcohol, which is a rather rare product, also has this property. That is, when reduced to a low temperature it forms a gum-drop-like substance, but if it is held long enough at the low temperature it forms a crystalline solid.

In the case of a glycerine non-freezing solution there are two factors which give protection additional to that indicated by the temperature at which crystals first begin to form. The first is that freezing does not occur at a constant temperature but covers a considerable temperature range. The second is that the formation of the first crystals may not take place until a materially lower temperature has been reached than the highest at which crystals *may* form. This property of the glycerine and similar solutions is referred to as ability to stand overcooling.

Since the accident in one of the altitude chambers at the Bureau, which occurred about two years ago, the other altitude chambers have been partly reconstructed to obviate such accidents or at least to reduce the chances of fatal results. One altitude chamber is now in regular service, while two others have been built and are available in case of need.

An archway of heavy masonry has been built outside the door, so that in case of an explosion inside the chamber which might blow off the door (which is made the weak part of the enclosure) the attendants would be protected against flame.

Shenandoah Engines Tested

A very extensive series of tests was run in the altitude chamber some time ago on the Packard engines for the Shenandoah, bearing on the performance of these engines from every conceivable point of view. The methods of control and of the taking of readings have been gradually improved until now test runs can be made in a minimum of time and with very little chance of a hitch.

The dynamometer which absorbs the power developed by the engine is located outside the altitude chamber. The test room now in service is the one that was built first. Since that time there has been a continual increase in the horsepower of aircraft engines, and for that reason some time ago the dynamometer no longer had sufficient capacity to absorb the full load outputs of some of the engines that had to be tested.

This difficulty was overcome in a rather ingenious way by combining an hydraulic brake with the electric cradle dynamometer. The hydraulic brake consists of a cylindrical chamber in which there are two sets of alternating disks, one stationary set carried by the housing, the other rotatable, carried by the dynamometer shaft. Water is allowed to run through the dynamometer housing, the inlet and outlet valves being adjusted so that a definite level is maintained in the housing, and the drag on the stationary plates or disks varies with this level. By varying the level the brake load can be varied. Only a rough adjustment of the load carried by the hydraulic brake is required, as the fine adjustment can be made by means of the rheostat control of the electric dynamometer.

In making a run, one man looks after the adjustment of the dynamometer load and of the engine controls (throttle, spark, and mixture ratio). Another man has control of the pressures within the altitude chamber and takes readings of the pressure gages which indicate the general pressure within the altitude chamber and the pressures at various points of the inlet tract. Pressure or altitude control is effected by means of a gate valve in the suction line of the air pumps or exhausters, which valve is hydraulically controlled from the opposite side of the altitude chamber. The control handwheels are located convenient to the gage board and adjacent to the latter is an indicator board on which are located pointers which are connected up to the exhauster valves and indicate their exact position.

Fuel Measuring Apparatus

The fuel measuring apparatus is located on the opposite side of the chamber and requires an additional man for making observations. Two upright cylindrical tanks are used, which can be filled from fuel drums outside the building by air pressure. Both tanks connect to a common feed pipe to the carbureter inside the altitude chamber, and one or the other can be shut off at will. Each of the tanks is provided with a gage glass, which is protected by a glass tube of larger diameter surrounding it. At certain zones the cross section of the fuel tank is greatly reduced by cylindrical inserts, so that when, during a run, the fuel level reaches the top of one of these inserts it begins to drop very rapidly. The difference in level between these zones corresponds to definite quantities of fuel, and any slight error in the level when taking the stop watch reading naturally corresponds to a much smaller error in the calculated fuel consumption than would a similar error if the fuel tank was of full section at the level where the error occurred.

At the present time a series of tests on superchargers operating under special conditions is being conducted in the altitude chamber. When an airplane goes up into the air, the change in the maximum output obtainable from the engine is due partly to the fact that the engine draws air from a rarified atmosphere and partly to the fact that the exhaust is discharged into an atmosphere of reduced pressure. By means of a mechanically driven supercharger the inlet pressure can be made independent of the atmospheric density, while the back pressure to the exhaust remains the same; with an exhaust turbine supercharger, on the other hand, the exhaust back pressure varies with the inlet pressure, or with the volumetric efficiency. It is now planned to determine the individual effects of variations in the volumetric efficiency and in the density of the atmosphere into which the exhaust is discharged, which line of investigation is hoped to throw new light on the supercharger problem as a whole.

Just Among Ourselves

Write It Yourself; Something New in Christmas Editorials

HO, Hum . . . Having Christmas on Friday's a pretty good idea. Not much use in coming into the office Saturday. Makes a nice week-end. Got to write that regular Christmas editorial though; wonder if anybody ever reads 'em? I'm sure I don't. Writing 'em is bad enough. With all this standardization work going on in the automotive industry, I don't see why all the automotive papers can't get up a standardized Christmas editorial. Have one editor write it every year; then maybe I'd be dead before my turn came around. Worth trying anyhow.

Well, well, this dawdling around won't get the darned t h i n g written. . . . Must get going. Wish I could think of something original to say . . . something original in a Christmas editorial! Ha! Ha! That's a good laugh. I heard about an editor once who got around it by writing an editorial about writing a Christmas editorial. Couldn't get away with that in a dignified publication like this, though. Don't think the boss would stand for it.

Guess there's nothing for it but to go ahead . . . something o r i g i n a l . . . well, let's see . . . ah, yes . . . here we go.

"We want to take this opportunity to wish our readers a very Merry . . . etc., etc." (A prize of one Happy New Year will be awarded to the first 1,000 persons supplying the first missing word. For the rest of it, write it yourself!)

Holiday Appeal Possible on Various Occasions

A GOOD bit of emphasis has been put upon use of the Christmas appeal in automotive selling in the last few years. Wonder how much use has been or could be made of similar special holiday appeals in various foreign countries and in sections of the United States in connection with holidays peculiar to the particular country or section. We have just received a list of h o l i d a y s throughout the world for January, 1926, from the Guaranty Trust Co. Many of them, of course, are purely religious holidays which couldn't properly be used for any such purpose as that suggested. Some of the others might, particularly those which involve to a greater or less extent the custom of exchanging gifts. Even in other instances, however, it would seem that a distributor or dealer avid for fresh merchandising appeals might find some way of tying his product in with the spirit of the particular holiday.

Business, Too, Makes Strange Bed-Fellows!

AMERICAN capitalists are said to have been flirting informally with Russian representatives just last week. A prominent group of the former, according to press reports, dined (the reports say nothing about wining) an equally prominent group of the latter at one of the cidatels of American conservatism within a brick's toss of Wall street, so who can tell what may develop? Agriculture in Russia today apparently has been entirely de-communized, while concessions are being made in industrial lines. Sales still have to be made through the Soviet Government, but that is not *per se* an insuperable bar to profitable business.

Considerable difference of opinion seems to exist at the present time about the desirability and the availability of Russia as a market for motor vehicles, but there seems to be little doubt that Russia could use a good many automobiles to advantage, despite the bad state of the roads in most parts of the country.

Bus Output 3 to 4 Per Cent of Truck Total This Year

THE growth of the bus business has been rapid and healthy. That growth seems likely to continue unabated through 1926. But with all the talk about buses and their use, the importance of this phase of the commercial vehicle business from a manufacturing standpoint at present should not be over-estimated. While bus output in 1925 probably will exceed that of 1924 by 35 to 45 per cent, the total production of vehicles of this type in actual figures will be something like 15,000 or 17,000. This means that despite a constantly increasing bus activity, bus output still is only about 3 to 4 per cent of total commercial vehicle production, taxicabs, excluded. This statement is meant to be in no way belittling to the excellent progress made by the bus interests, but simply to help maintain a perspective which tends to become a bit obscured sometimes in the midst of highly commendable enthusiasm. We can find no basis for estimates of 1925 bus production running as high as 50,000 which have been made in one or two newspaper statements.

Buying Habits and Distribution Methods

A GOOD many distribution plans in the automotive industry have failed to function satisfactorily because they were designed to suit the convenience of the manufacturer building the product rather than of the customer who buys it. Public buying habits seem likely to be the determining factors in the success or failure of any distribution system for the next hundred years or so at least. Consequently, those habits can well be considered as the basis, rather than as a result, of any given system of distribution.

N. G. S.

Trade Days are YOUR

Real Business Opportunities are Lost if You Neglect Them

By NORMAN G. SHIDLE

TRADE DAYS at the National Automobile Shows are vital to the successful continuance of the big yearly events.

The Trade Days are not an ephemeral promotion idea, dug up to stimulate temporary interest, nor do they constitute a casual phase of the 1926 or future Show programs.

Trade Days are useful, productive and *necessary.*

When first the Trade Days Idea was started last year, it was given considerable publicity and gained a good bit of commendation from a number of prominent automotive executives. But the full significance of the Trade Days' idea hasn't penetrated yet.

The question is too important to the industry to be permitted to slip by without active and serious thought.

Here's why the Trade Days are necessary:

1. The public alone won't continue forever to provide sufficient support to a National Show. Gradually the automobile becomes less and less of a curiosity. Public support always will be available, but it will decrease rather than increase. (That statement came from a man who knows more about automobile shows probably than any three others that anybody can name.)

2. Shows cost money.

Need for decreasing merchandising expense grows every year.

Only a small part of the merchandising possibilities of the National Shows is realized when the direct appeal is solely to the public; when the trade is taken care of only in an incidental and casual way.

A national show without Trade Days is inefficient from the standpoint of merchandising expenditure. The manufacturers spend the same amount of money whether Trade Days are held or not and whether or not they take advantage of the Trade Days when they are held. They can at least double the merchandising value to be obtained from the show by taking advantage of the Trade Days.

3. Psychologically, the trade needs some official gathering each year where everyone—dealers, distributors, car builders and parts and accessory manufacturers—can get together. Such a gathering, as a trade, tends to promote a feeling of unity and cooperation which has a very definite business value.

Petty criticisms or desire for personal social enjoyment during Show Week shouldn't be permitted to obscure these fundamentals.

In addition to the basic factors which make Trade Days an essential of the National Shows of the future, the special times set aside for trade attendance offer numerous other advantages to car and parts manufacturers, most of which have been set forth many times before. Among these are:

1. Car makers have an opportunity to show their cars to hundreds of dealers, both of their own and rival organizations. They have a chance to show the merits of their models to these distributors and retailers at a time when the whole attention of the latter is centered on the business in hand. The car builders who take advantage of this opportunity get the most out of their show investment; those who don't simply pass up a good merchandising bet.

2. Vehicle engineers have a chance to see assembled in one place the latest products of the parts and accessory industry. They can examine in a short space of time all of the new things they have heard about and see many others about which they haven't heard.

3. Parts makers have an opportunity to talk to these factory engineers as well as to members of the retail and

at the Shows

Days!

TRADE DAY DATES

	Mornings
New York Show	Monday and Tuesday January 11-12
Chicago Show	Monday and Tuesday February 1-2

wholesale trade without the confusion of surging crowds to distract attention and make ordinary conversation uncomfortable.

4. Sales manager, sales department representatives, and factory engineers get an excellent chance to meet members of the retail trade, to talk with them and to hear their comments and ideas about various merchandising and design phases of the business.

Factory men are sometimes inclined to treat too lightly the advantages to be derived from close contact with the retail field. At best the factory man can get into close touch with retail conditions only occasionally, but still the success of his activity as a factory man depends very largely on his knowledge of reactions to his work in the retail field.

By spending a whole week in his booth at the New York Show it is quite conceivable that the chief engineer of a passenger car company might find out more about what's wrong with his product than two months of laboratory tests would tell him. Getting the human touch on engineering problems is one of the hardest things possible for a good many engineers. They are contemptuous—often rightly—of unscientific opinion about car design, and sometimes fail to realize fully that the vehicle is built for the man who is going to buy it rather than for a body of automotive scientists who might award it a gold medal with a pink ribbon.

Hanging around a show booth is a tiresome job for the man who is self-centered. It's the most interesting job in the world for the man who likes to study people, to find out what they are thinking about and to interpret the ideas of the dealers in terms of his practical design problems.

For after all, the advantages outlined for the Trade Days can be obtained only in proportion to the extent to which a given organization actively participates in the scheme. The passenger car booth which is barren of factory engineers offers little charm for the man in the trade who wants to learn something about the mechanism that he doesn't already know. He is far more contemptuous of the fair-haired salesman with a glib tongue and minimum knowledge than the factory engineer ever could be of the man in the trade. And the factory engineer will learn very little of what dealers think of his product if he parks himself in a hotel bedroom with just Johnny Walker and a few old pals for company.

On the two Trade Days of the National Shows every passenger car factory should have a competent factory engineer in attendance.

Only by so doing can the factory and the engineer derive maximum benefits from the money spent in exhibiting and in bringing a force to the show.

Salesmanagers will tell you that it's practically impossible to talk business with a dealer in a show booth. That's probably true. But, by the same token, it's impossible to meet dealers casually, make new acquaintances and get a good picture of what's going on in the trade by staying in a hotel room.

Representatives of the factory sales department should be in attendance at the booth on the two Trade Days of the National Shows.

Last year the Trade Days proved successful. But nothing like their best possibilities were realized.

This year a good many factory men have resolved that it's going to be different. More factories than ever are planning to get the most out of their Show dollar. They're going to have a representative factory staff at the show during Trade Days.

How about you? Will you be there?

British Body Designers Seek Comfort and Improved Appearance

Trend of new car design is in line with American progress. Pyroxylin finishes gain in popularity. Unique means of body suspension and top regulation.

By K. W. Stillman

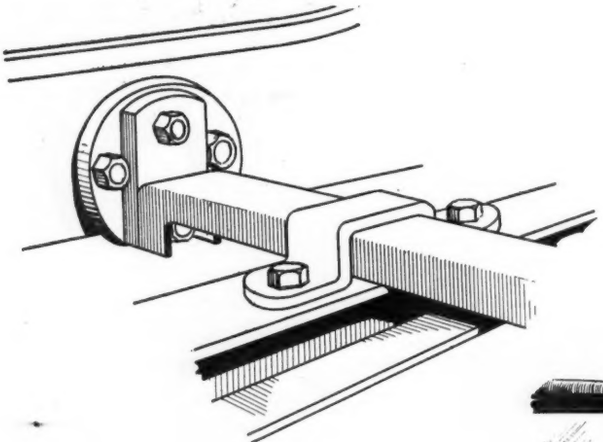
BRITISH body designers are, in general, following along the same lines as those adopted by American builders in trying to increase comfort, decrease weight and facilitate servicing. Notable changes in design have been made during the past year, many of them along lines previously taken by designers on this side but a number being distinct innovations and worthy of consideration by American builders.

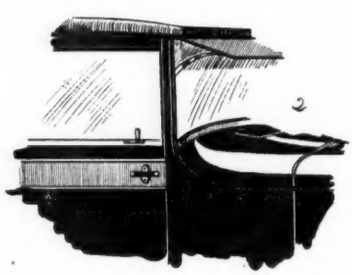
Among the latter is the rather widespread use of removable and sliding front seats which have just recently been introduced in this country. As a means of providing uniform comfort for drivers regardless of variations in the lengths of their legs this appears to be a worth while improvement.

Flexible connections between the body and the chassis to eliminate vibration have been given considerable study by British designers and some practical methods of value have been developed during the past year. Continued improvement of side screens for open bodies offers possibilities for American manufacturers to increase the popularity of their open models if they so desire. Along with this development a great deal has been done in England toward making the much maligned "one man top" just what its name implies and several unique arrangements have been developed for this purpose.

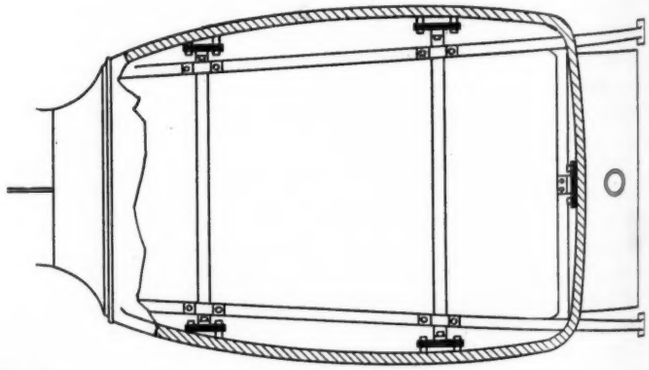
Possibly the most important trend of the past year in which British practice is following American methods is the widespread adoption of pyroxylin finishes, or cellulose, as they are called in Great Britain. A considerable percentage of the cars which have been shown at the various British shows were distinguished by the satin finish obtained by the use of pyroxylin paints in contrast with the lustrous finishes which have been in general use heretofore. The same reasons appear to be influencing British body builders in selecting this method as were instrumental in bringing about its adoption in this country—ease and speed of application and durability of the finished surface.

There is evidence that chassis builders have been giving more attention to the needs of the body makers and the modern chassis are much more adaptable to good coach work than has been true before. Frames are wider so that the body builder has more space in which to place his seats, wheelbases have been altered to correspond with the proper length necessary for comfortable seating arrangements and the designs of radiators, hoods, dashes and similar items have been considered from the viewpoints of the body builder instead of simply as an unimportant part of the chassis. The result is that the new jobs give the appearance of a complete unit from

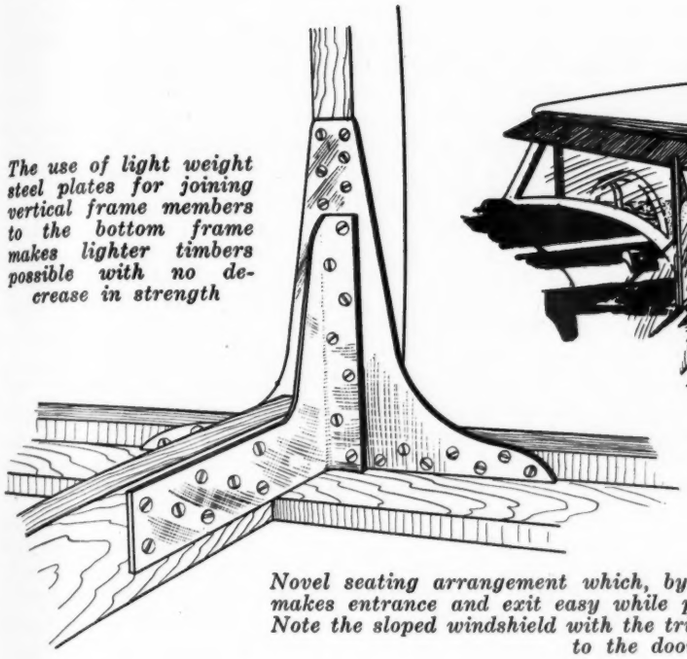




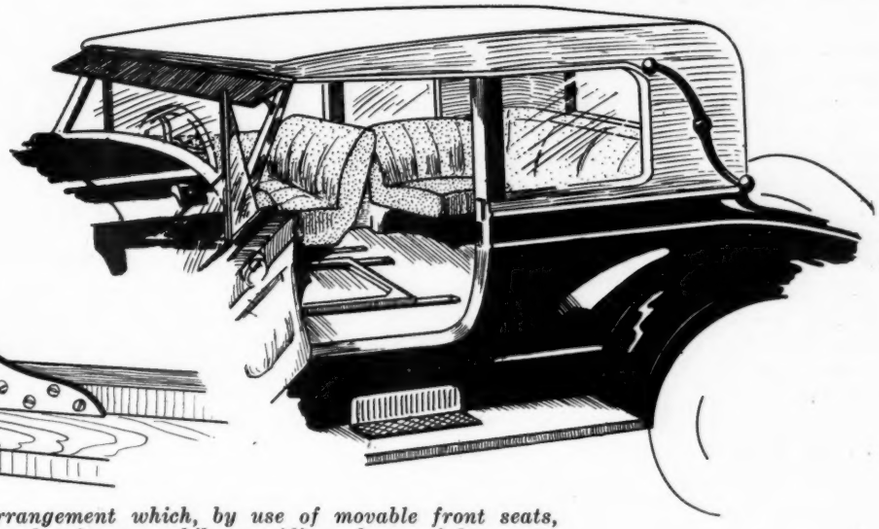
ABOVE: *Close-up of Young flexible connection as used when the body is considerably wider than the frame.* RIGHT: *Steel framework for supporting the top structure makes narrow pillars possible, thus giving the driver and passengers better vision*



ABOVE: *Plan view of the five point flexible body suspension developed by James Young. The body hangs quite free from the chassis and is insulated from road shocks by disk couplings which absorb the vibrations of the chassis*



The use of light weight steel plates for joining vertical frame members to the bottom frame makes lighter timbers possible with no decrease in strength



Novel seating arrangement which, by use of movable front seats, makes entrance and exit easy while providing plenty of leg room. Note the sloped windshield with the triangular glass panels attached to the doors

the radiator to the tail-light—each part harmonizing in design with all other parts.

Following the path blazed by this country, Great Britain's manufacturers have gone far during the past year in putting closed car production on a basis which permits this popular type to be fitted on chassis of moderate horse power and sold for a price within reach of most everyone who can buy any sort of a car. In order to produce satisfactory closed cars which could be sold at fairly low prices there has been, of course, much study as to design and production methods but this has produced nothing very different from American practice.

The composite body is most widely used. To lighten the framework many builders use steel brackets to fasten the vertical members to the bottom frame thus making unnecessary the heavy members considered so necessary but a short time ago. All-steel bodies are being used to some extent but not as much as in America. Most Britishers are agreed on the desirability of this type of body, particularly for large production jobs, but the comparative scarcity of large runs as compared with American plants and the considerable expense entailed in commencing all-steel production by reason of the cost of dies and presses has retarded development considerably.

Fabric covered bodies are used to some extent because of their lightness and ease of keeping in good condition. There is still considerable skepticism apparent, however, as to whether a structure of such light design is sturdy enough to stand up when driven over the many rough roads which take British motorists into the rural districts.

Saloon Body Is Favorite

The favorite closed body is the saloon, corresponding to our sedan, and during the past year there has been a distinct trend toward equipping these bodies with four doors, higher sides, larger window spaces and wider seats—all in an attempt to provide greater comfort which, in Great Britain as well as in this country, seems to be the most potent sales appeal.

The doors are very wide with the intervening body pillars as narrow as strength requirements will permit. Sides of the the bodies have been raised and the roof either lowered or so designed that an appearance of lowness is given. Because of the wider frame which chassis builders have provided the rear seats have been made wider and by the use of streamline curves above the shoulder line the capacity of bodies have been considerably increased.

Adjustable drivers seats are quite common. These are usually mounted on rails and have a sliding movement of several inches backward or forward. In some jobs they are also adjustable vertically so that no matter what size person is driving his position at the steering wheel can be made comfortable. Some difficulty has been experienced in placing the wheel and pedal controls so that they are not out of reach or in an unhandy position for some locations of the driver's seat. While this has not been entirely overcome in all cars there are few in which it has not been given attention with the result that in practically all positions of the seat, control is easy.

Seats Present a Problem

In widening the doors much of the possible benefit has been lost in some cars by the front seat extending out in such a manner that half of the opening is unavailable for entrance or exit. There appears to be no way in which this condition can be changed unless the front compartment is made much longer than is otherwise necessary but it is possible, as is evidenced in several cars, to so design and locate the front seat that inconvenience from this will be reduced to a minimum.

Much of the noisiness of closed cars has been laid to roof drumming and British makers have quite generally adopted types of roofs which eliminate this source of annoyance to passengers. The usual construction is to cover the light wood slats with canvas, then a layer of felt, followed by a thin waterproof lining and then the leather top. Metal cornices shaped like a gutter are used to carry off water. In metal tops padding has been used in an attempt to reduce drumming tendencies and in the larger cars the roof expanse is broken up by ventilators which have a similar effect. Felt is generally used under the metal side panels to eliminate noisiness and the cumulative effect of all these measures has been almost entirely to eliminate the noise which only a short time ago was considered an unpreventable defect of closed cars.

As an aid to lighter body construction and for the purpose of relieving the body structure of stresses and strains transmitted through the chassis and resulting from road shocks, vibration, etc., flexible connections between the body and the chassis have been used to very good purpose. Two methods in particular have been developed which appear to give very satisfactory service.

In a method developed by James Young the seats are mounted directly on the chassis as in the Weymann type of construction. The body is suspended from the chassis by five flexible disks, two on each side and one in the rear. These flexible disk couplings are placed vertically between the chassis and the body. When the body is considerably wider than the chassis a rigid steel channel section is bolted to the frame and the disk connected to this instead of direct to the chassis. When the chassis is distorted by passing over rough roads or when vibration is set up the stresses are absorbed in the disk and are not transmitted to the body thus permitting it to be of much lighter construction than usual.

The Daimler Method

The other method of flexible suspension is used by Daimler and consists of a special steel body frame on which the coach work is mounted, completely insulating it from the chassis. The frame is fastened to the chassis at the front by a special form of hinge pin and at the rear it is supported by rubber buffers which effectually deaden road shocks and vibration. Since, by this method, like that used by Young, there is no direct rigid connection between the body and the chassis, the distortions of the latter have no effect on the body and a very light body structure is made possible which does not develop squeaks and rattles after a short period of service.

In the continued search to find ways for lightening the body without sacrificing necessary strength, British makers have developed or adopted methods of hinging doors which eliminate the heavy butt hinges formerly used and employ instead a light form of outrigger which prevents door dropping. Considerable improvement was noted also in the type of door locks and catches employed, the trend being to provide more positive and easy closing.

Sliding windows have been more popular in Great Britain than the drop type familiar to Americans so that the distinct trend toward the latter evidenced at the last Olympia show was a subject for comment. When drop windows were used they were nearly always equipped with regulators similar to the American types and the frameless plate glass lights slid in cloth lined rubber channels instead of the metal type used before. The general opinion seemed to be that while the sliding type windows are more convenient, especially for the driver to open for the purpose of making hand signals, the drop windows give much better ventilation and that factor is being given increasing attention in Great Britain as it is in this country.

In attempting to provide British motorists with open car freedom in fine weather and closed comfort in inclement weather with a minimum of labor and inconvenience to the driver some very interesting designs have been made. Possibly the most interesting is a so-called saloon body by Salmons in which the whole top structure is balanced by springs and light steel braces so that it may be raised or lowered very easily by one person. To facilitate this movement the action has been connected to a small cranked handle fastened to the rear outside of the body so that the driver simply turns the crank and the top is raised or lowered as is desired.

Other manufacturers have tried various methods to accomplish the same result with more or less success. By relocating the hinge points of the top braces, by obtaining better distribution of the weight and by similar means considerable improvement has been made. This is of more importance to British motorists than to those of this country because driving with the top down is a common practice there while it is seldom done in this country even by owners of cars with a top structure which can be lowered. It is possible, of course, that the decline of open air driving in America has been influenced by the difficulty of adjusting many so-called one man tops and a movement to provide better facilities for lowering and storing the top structure might increase the practice, since we certainly have as large a percentage of fine weather in which open air riding would be enjoyable as Great Britain can boast.

In many cars, particularly small ones, a light steel structure is being used to support the top with an automatic hinging device for the rear windows so that the entire unit, top and side, can be folded and lowered level with the body rail. It is a general practice in Great Britain to make the side windows or screens separate from the top even in touring models so that even though the top may be lowered the screens can be kept in position to keep excessive wind from annoying the passengers. Many interesting methods have been employed to provide these independent screens, especially in the less expensive cars where celluloid screens set in metal frames are used, and for permitting them to be folded and stored out of the way when they are not wanted.

The roadster type is very popular in Great Britain and as it is often fitted with rear deck seats attempts have been made to make these more comfortable. Widening of the rear and raising the sides have contributed to this end and many cars shown had dickey seats in which two passengers could be carried very comfortably.

As a direct contribution toward the comfort of passengers many cars were fitted with pneumatic cushions, foot rests for rear seat passengers, and arm rests are in more evidence than they have been before.

Designers Seek Comfort

The general impression gained from a survey of new models is that more and more consideration in being given by body designers to providing the maximum comfort in their cars. This is logical since at the present stage of progress of automotive engineering there are usually several cars in each price class which, to the average person, appear to have few distinguishing features in so far as preformance, reliability, economy and similar factors are concerned. So the person who knows little or nothing about the "insides" of a car, and this includes a large proportion of car owners, has little upon which to base his choice except the appearance and the comfortableness of the several makes under consideration.

That manufacturers should be influenced by this condition is natural and proper. Most persons are influenced by things which they understand. Nearly everyone has a mental standard of comfort against which he can judge cars and arrive at a decision, which to him at least, is accurate. Just as many persons, but possibly with less reason, believe themselves to be good judges of appearance. It is quite natural then that such persons should be more strongly influenced by these factors which they feel they are qualified to judge than by statements concerning technical matters which, while they may not admit it, are beyond their comprehension. Of course the engineering excellence must be present to keep them sold on their car but comfort and appearance are exceptionally helpful in making the sale.

Glycol Advocated as Anti-Freeze Solution

Compound is intermediate between alcohol and glycerine in regard to composition and physical properties.

THE use of glycol or ethylene glycol, a compound intermediate in its composition and physical properties between alcohol and glycerine, for the preparation of non-freezing solutions for the cooling systems of automotive vehicles, is being advocated by the Carbide and Carbon Chemicals Corp., New York City, which has placed on the market a commercial product of this nature under the trade name of Prestone.

Ethylene glycol has the chemical formula $C_2 H_4 (OH_2)$, and is sometimes referred to as a di-acid alcohol. It is claimed to combine some of the desirable properties of both glycerine and alcohol, while in other respects it surpasses both. Thus a certain volume proportion of ethylene glycol will depress the freezing point of water more than an equal proportion of either alcohol or glycerine.

Ethylene glycol is a colorless, odorless liquid, soluble in water in all proportions. It has a boiling point of 387 deg. F., and a specific gravity of 1.114, making the weight per gallon, 9.36 lb. It is non-inflammable, non-toxic, and also is claimed to be non-corrosive. When added to water it depresses the freezing point according to the glycol content, up to a concentration of 60 per cent, a solution of which strength has a freezing point of 56 deg. F. Aside from having no corrosive action on metals, rubber and other materials of construction, it is said to have no solvent action on nitrocellulose, gums and other materials commonly used for finishing automobiles, so that if some of the solution is accidentally spilled on any part of the car it will not injure the finish.

Prestone, the commercial product referred to, also is soluble in water in all proportions, which permits of lowering the freezing point of the cooling fluid in accordance with different requirements. Even though the concentration of the solution may be insufficient to prevent the formation of ice, the solution will not freeze solid. The water will separate out and form crystals, and this will increase the concentration of the remaining solution, thereby putting a check to the freezing action. Thus, instead of the solution freezing up solid, as does the pure water ordinarily used in the cooling system, it forms a slush, and the stresses due to the expansion of the freezing liquid, which often cause cracking of the water jacket, are therefore non-existant.

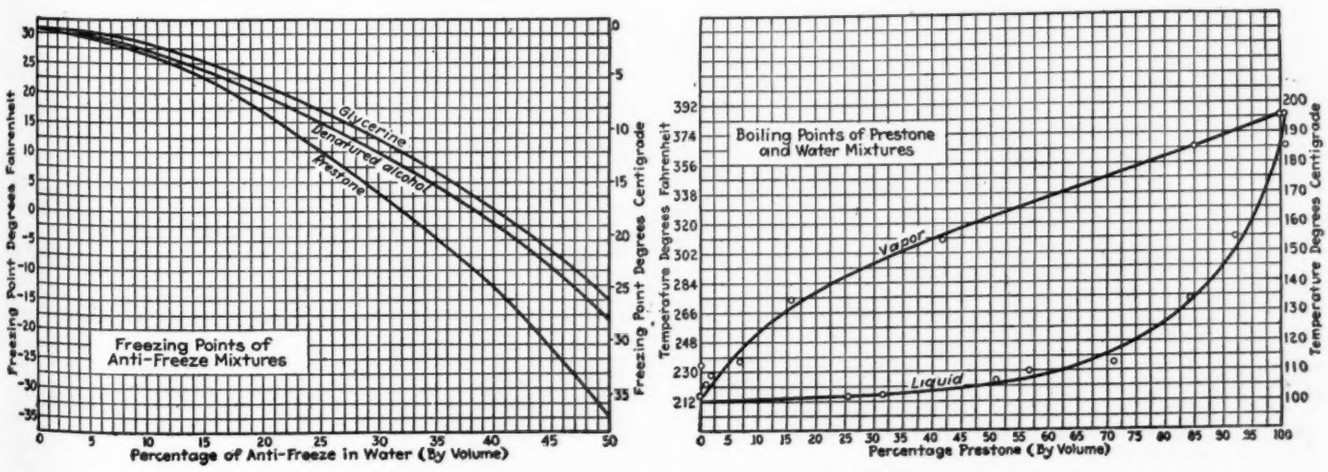
It is claimed by the manufacturers that Prestone solutions do not loose their non-freezing properties after continued use. The boiling points of Prestone solutions are never lower than the boiling point of water, and solutions containing as much as 60 per cent lose practically no Prestone through vaporization. If the engine becomes exceptionally warm through faulty operation of the fan, etc., the cooling water will boil off, with the resulting indication of an overheated engine, but Prestone will remain in the cooling system without having been harmed by the excessive temperatures.

Automobile engines usually operate most efficiently at a temperature ranging from 175-200 deg. F. if the temperature is increased, and reaches 212 deg., the cooling water boils, whereas if the temperature is decreased, the oil in the crankcase becomes diluted by unvaporized fuel. A solution containing 35 per cent of Prestone boils at 216 deg. F., which permits normal operation of the engine under the conditions for which it was designed. The use of a radiator cover on automobiles aids in raising the temperature to the point of maximum efficiency and tends to limit crankcase dilution.

If anti-freezing solutions with lower boiling points are used, there is a continual loss of the solute whenever the temperature of the engine reaches the point of most efficient operation. Therefore, when an anti-freeze compound which boils off at a temperature below 175 deg. F. is used, the engine is usually operated either at low engine temperatures, with a resulting loss in efficiency, or with a continual loss of the anti-freeze compound. If a radiator cover is used such a loss is even more pronounced.

The four accompanying charts show the physical properties of Prestone solutions of different concentration, some of them being compared with the corresponding properties of alcohol and glycerine solutions of equal strength.

We are informed that the retail price of Prestone varies between $3.00 and $3.50 per gallon.



Freezing points of anti-freeze mixtures and boiling points of Prestone solutions

The Good Roads Revolution in South America

THIS article is based on the observations of the writer during his recent visit to South America as chairman of the official U. S. delegation to the Pan American Road Congress, which convened at Buenos Aires, October 3 last.

The delegation sailed from this country on September 3 and returned early in November. During the course of the trip most of the important countries of South America were visited.

Mr. Rice is vice-president of General Motors Corp. and formerly was president of the Cadillac Motor Car Co.

Automobiles have made continent "road conscious" and development program of vast dimensions will soon be under way.

By H. H. Rice

IMAGINE New York City without a single hard surfaced road leading out of it.

Think of Detroit as days away from Toledo by road, Chicago as cut off from the rich agricultural areas of Illinois, Los Angeles as susceptible of approach from San Francisco only by rail.

In short, turn back the pages of history in the United States to the period of thirty years ago and some idea will be gained of the sensations experienced by the delegation from this country to the Pan American Congress of Highways as they traveled through South America—with just one essential modification.

Thirty years ago the people of this country had no motor vehicles and consequently no understanding of what modern travel over improved highways might mean.

The people of South America not only have thousands of motor cars in their cities today, but they are buying thousands more, and they have as keen an appreciation, if not a keener one, than we, of what the vehicle means in social as well as economic development.

Because of that fact, because the day is fast approaching when the physical limitations of floor space will make action necessary, South America is on the verge of a road building program of vast dimensions.

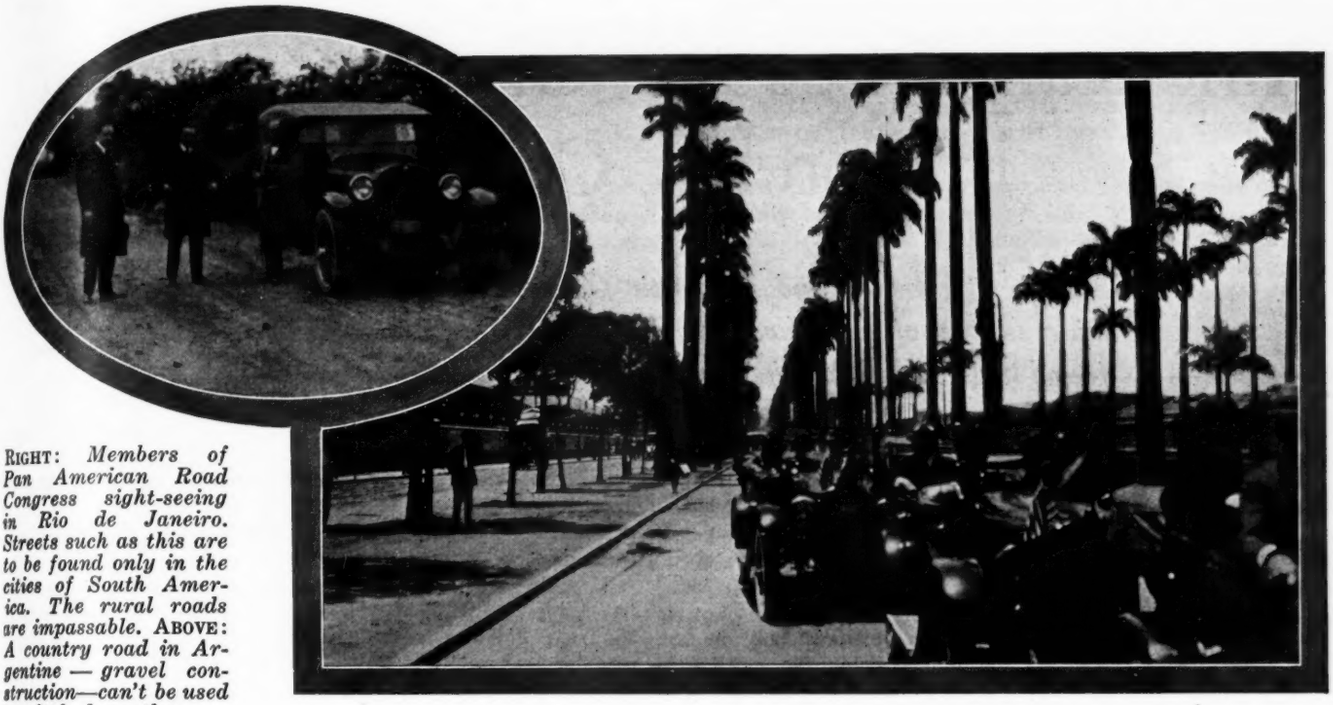
What that program forecasts in the future up-building of internal and foreign trade for the republics of South America it is difficult to say and yet it is the unanimous judgment of the members of the delegation that nowhere in the world today is there a greater business field than South America presents.

Unlike Europe with its systems of highways laid out far in advance of motor or steam transportation; unlike this country with its network of highly efficient railroads, the countries of South America are inadequately supplied with transportation means of any kind.

The railroads which exist have been pushed through at great expense and only after severe hardships. They are the backbone of internal communication and yet there is not a sufficient mileage to develop the virgin areas nor is there capital available to build extensions which would not, generally speaking, be immediately profitable.

The great need is a system of highways and highway transport which will serve to extend the economic zone of the railroads, give the country a means of communication with city markets, and provide ways of penetra-

Members of the Pan American Road Congress being entertained in Santos, Brazil



RIGHT: *Members of Pan American Road Congress sight-seeing in Rio de Janeiro. Streets such as this are to be found only in the cities of South America. The rural roads are impassable.* ABOVE: *A country road in Argentine — gravel construction—can't be used in bad weather*

tion into the almost inexhaustible areas of natural resources of every kind and description.

Taken as a whole, the project is so stupendous as to give pause even to those accustomed to post war calculations but fortunately the task is one which automatically sub-divides into a series of small operations possible of almost immediate solution.

While the delegation was in South America, the Chilean Congress passed first legislation looking toward the construction of a modern road covering the 215 miles which separate Valparaiso from Santiago; the Brazilian government announced a project for the improvement of the one hundred miles of highway still unimproved out of the 300 between Rio and Sao Paulo; and the National Argentine government considered favorably a law looking forward to national participation in highway construction in the Republic.

These are all independent, unrelated projects and yet each one of them is as important in its way as was the completion of a transcontinental railroad in the United States in years past.

Perhaps a concrete instance of the effect of road building affords the best illustration. The only related highway system which the delegation inspected on its journey of 15,000 miles was found in the miles of hand wrought highways which have been pushed out through the fertile coffee fields which surround the city of Sao Paulo, Brazil.

Last year one motor car manufacturer assembled 16,000 cars for use in all Brazil and more than 10,000 of the entire lot found a use on the Sao Paulo highway system. Traffic of commodities and persons flows at a steady rate over that system in and out of Sao Paulo, commercial and social life has been quickened and the highly efficient engineer who directs the program, Senor Penoeado, is being pressed in all directions for a further extension of his roads.

What has been done in Sao Paulo remains to be done in Rio, in Santiago, in Valparaiso, in Lima, in Buenos Aires, practically every city large and small in South America.

The part which the United States of America can play in this program is best demonstrated by the part which its delegates took in the sessions of the first Pan American Congress of Highways.

There the delegates from nineteen countries met and discussed all of the many-sided phases of highway construction, finance, administration and use in their relation to the social and economic development of all of the nations of the Pan American Union.

It was agreed that interchange of men through conferences, scholarships and other methods was the first step to a better understanding of mutual problems.

Arrangements were made for a constant interchange of information between the authorities of all of the countries and for the promotion of public understanding of highway problems through the Pan American Confederation for Highway Education.

Since the return of the delegation from this country arrangements have been made to see that all of research and other information developed here is made available while South American plans for continuation of the work are found in moves looking toward a conference in Rio in 1927 and a preliminary session in Cuba next year.

Beyond this work of cooperation there is not much which the United States can or should do. Essentially the problem of highway development in each country is one for the people of that country themselves to undertake. Their progress will be rapid or slow according to the degree of importance which they give to the benefits which they will receive from improved methods of transportation.

If the public statements of the chief executives of the six countries visited by the delegation; if the hundreds of columns of favorable discussion and editorial comment caused by the legislation's trip; if the actions of the several national congresses and of the Pan American Road Congress can be taken as a criterion, then South America is alive to its own needs.

The consummation of the highway program there will come more rapidly than it did in the United States because the task of motorizing the public has already been accomplished and the work of perfecting road development is now a known instead of an unexplored field, as it was when we began 30 years ago.

American Buses are Given Preference in Foreign Countries

Bureau of Foreign and Domestic Commerce completes world-wide survey of bus lines and markets. Rapid development is found in all countries where roads permit of motor transportation.

THE last of a series of three reports covering motor bus transportation in foreign countries has been released by the Automotive Division, Bureau of Foreign and Domestic Commerce. In commenting upon the results of the world-wide survey the Division writes: "It is remarkable to note that where roads and needs of a country permit, the growth of bus transportation is no less phenomenal than that which is taking place in our own country. It should prove of keenest interest to American bus builders that in practically all countries where buses can be used, American buses are accorded a decided preference."

In the September 17 issue of *Automotive Industries*, summaries of the Division's reports were given for Australia, Brazil, Ceylon, China, Columbia, Danzig, Denmark, Dutch East Indies, Esthonia, India, Latvia, Japan, Madeira Islands, Philippine Islands, Uruguay and Venezuela.

Following are concise reviews of bus conditions in the 23 foreign countries covered in the last survey:

France—More than 54,000 buses were in operation in 1924, most of them being of French manufacture. The local industry is well established and is aided by the State. The operation of this form of transport and manufacture of the vehicles has been so long established that there is, at present, little opportunity for the sale of foreign made buses. Bus traffic is largely in the hands of well established monopolies or operating companies.

Egypt—From its start about five years ago bus progress has been rapid but unsystematic throughout the thickly populated Delta region. Between 800 and 900 buses are now in operation, half of which serve the urban population of Cairo and Alexandria. About 95 per cent of the buses are one-ton truck chassis with locally built bodies which, while built without proper facilities, are too low priced to afford much opportunity for competition by American-built bodies. Two class, 16-passenger bodies are favored in Alexandria, and one class, 16-20-passenger bodies are used elsewhere. Their more frequent service and lower fares have made buses popular with all classes and contemplated highway improvement should speed the development of the industry.

Canada—About 2,000 buses with capacities for eight or more passengers are in operation in Canada, principally under the control of tramway companies. Consolidated schools in the prairie provinces and tramway and sightseeing companies are considered to be the best prospective purchasers of any bus equipment. Conditions which work against more rapid development are absence of hard surfaced highways, severe winter climate which makes bus operation between December and April impracticable, comparatively low fares charged by railroads and the lack of sufficient intervening towns to provide passengers on interurban runs. In cities and suburbs roads are usually excellent and other conditions are favorable to increasing use of buses. Practically all bus chassis are American-built and equipped with Canadian bodies.

Ecuador—Lack of suitable roads has been the principal reason why only 20 buses are in operation. Even in the main city, Guayaquil, only one or two streets are suitable for economical bus transportation. The majority of the buses used are 20-passenger and have been imported complete from the United States.

Costa Rica—When funds are provided for highway and street construction this should become a better market. At present the 25 buses in operation cover all the important routes although they are usually crowded. The buses consist of locally built bodies on truck or passenger car chassis.

British East Africa—Two converted light American trucks constitute the present bus facilities and small hope is given for the development of any considerable market in the near future. Long distances between towns, prevalence of light taxicabs, rickshas, motorcycles, bicycles and private automobiles are thought to serve all the present transportation needs.

French Morocco—The motor bus is a very important means of transportation. A great system of roads covering about 2,100 miles has been built and the Government is favorable to buses, as is evidenced by the fact that one of the operating companies receives an indirect subsidy. The public favors the bus over the narrow gage railways. Special bus chassis of 2½-ton capacity are preferred although nearly all standard chassis are American. Nearly all bodies are built in Cassablanca. Prospects are good for fleet sales of from 10 to 12 chassis to operating companies if individual sales efforts are employed.

Guatemala—Passenger cars are used for cross country transport because of the narrow winding roads. A few buses with home-made bodies on light chassis are used to carry crowds to and from bull fights, races and other festivities. Recently 20 chassis were purchased in the United States, 15 of which will take the place of street cars to be operated on tracks while the remaining five will be operated as buses. There is practically no market for heavy buses.

Guiana—Since most roads suitable for bus operation parallel the Government owned railroads, bus competition has been curtailed by levying annual taxes amounting to as much as $300 per bus. Forty buses with locally built bodies are used in and around Georgetown and the east coast. There are no buses in either Dutch or French Guiana and their introduction is not considered feasible at this time.

Haiti—Slowly improving road conditions have been

instrumental in bus development. It is believed that as many buses are now on order as are in use and their delivery will meet all demands for some time. Most buses are standard truck chassis fitted with local bodies. About 15 bus lines operate a total of some 50 buses.

Siam—About 32 buses are in operation in Bangkok; the number used in the interior is unknown but is much smaller since poor roads prevent bus operation to a large extent except in cities or between neighboring towns. Buses are crude bodies mounted on second-hand passenger car chassis.

New Zealand—Bus lines have become active competitors with steam and electric rail lines. In Wellington street railways are owned by the city so that there is some hostility toward buses, although they have been used on some feeder lines. The Government railways are using buses for feeders in some parts of the Dominion. Private companies operate most of the buses around Wellington and they favor American buses, while municipalities favor British. Most buses are truck chassis with locally made bodies. Special bus chassis are not considered suitable to the hilly and winding streets of Wellington but they could be used to advantage on some of the cross country routes. Considerable expansion is inevitable. Cities which have no street railway systems as well as where extensions to existing systems are necessary should be good markets and there is also a need for more interurban lines.

Northern Ireland—About 725 buses are in operation of which 162 have fixed routes and time schedules. Outside of Belfast, which has a municipally owned street car service, the cities of the district are in favor of buses and Londonderry has replaced street cars with municipally owned buses. Standard passenger car chassis are generally used. Some American types are in favor, but British buses built for the Isles trade, are well received. Buses of 20 to 30-passenger carrying capacity are preferred. No British buses come complete with bodies. A considerable body building industry has been built up in Belfast.

American Chassis Predominate

Norway—Owing to the rugged nature of the topoggraphy, use of buses is mostly confined to the larger centers although converted touring cars seating from seven to eleven passengers have been used recently in the mountainous regions. About 865 buses of all types are in operation over 445 bus routes covering 7,700 miles. Both the authorities and the public favor buses. Standard motor trucks with bodies built by the local builders are in general use but it is thought that there is a market for special bus chassis. Both open and closed types are in demand of 25 to 30-passenger capacity. American chassis predominate in all the large cities.

Persia—Passenger cars and trucks are used exclusively by bus lines now operating. The roads are not suited for heavy bus traffic due to the high passes met with on most of them.

Salvador—The market is very limited. Eleven buses are in operation and five more on order from the United States by a local firm which has been granted a concession to operate in the city of San Salvador. If this venture proves successful more buses may be ordered. All buses are privately owned and consist of old passenger car chassis with home-made bodies.

Jamaica—Several attempts have been made to operate buses but because of the narrow unsurfaced highways and high cost of equipment and labor these have not been successful and there is practically no market at the present. After improvements are effected in Kingston there will be a small market for buses to serve some of the suburbs.

Spain—Inadequacy of rail service and general improvement of roads has caused a considerable development of bus transportation during the last five years. About 1,000 are now in operation. Authorities and public are in favor of buses. The Government is encouraging the use of Spanish built buses by special concessions and high protective tariff. Until a year ago passenger cars or light American truck chassis were used for bus work but now specially built truck chassis of 1½ to 2-ton capacity are coming into favor. About 75 per cent of bodies are Spanish built which, although high priced and of inferior quality, sell for less than American built bodies because of the high tariff.

Buses Only Means of Conveyance

Spanish Morocco—Buses are the only means of conveyance generally available because of inadequate railroad facilities. Nineteen buses are in operation in and around Tangier and are favored by the authorities and the public although small touring cars for hire are popular, especially in the hill country. Large interurban buses are barely making expenses because of this competition. Standard passenger car chassis are generally used with some inclination toward special French chassis. All bodies are built locally. Future sales possibilities are considered small.

Sweden—Motor bus traffic has more than doubled during the past two years and on June 1, 1925, 1,050 private lines operated about 3,500 buses. Saturation point for buses is remote since many light cars and obsolete buses will be replaced with better equipment as traffic grows. Passenger car chassis have been used mainly but a demand is now in evidence for special bus chassis—four and six-cylinder jobs with 150 to 160 in. wheelbase and bodies for 16 to 24 passengers being in greatest demand. Most bus bodies are built locally. Nearly 90 per cent of all motor vehicles are of American manufacture.

Switzerland—The peculiar market requirements and operating conditions have made the use of Swiss buses general. Heavy buses have found no market and although light buses might be sold the market is so small and the conditions so peculiar that little has been accomplished. It is known that a single American bus is being used although there appears to be no legal restriction against their use except on lines operated by the Swiss Post Office. The attitude of the public is favorable toward buses which do not compete with Federal or private railways capable of giving satisfactory service. No new bus lines are known to be in contemplation.

Turkey—Motor bus transportation is practically nonexistent. War stocks of motor vehicles liquidated by the Armies of Occupation more or less demoralized this as an automotive market. Only eight or nine buses are in operation and establishment of new lines is not contemplated so far as is known.

Union of South Africa—Bus transportation, while still in the experimental stage, promises to develop rapidly. Greatest progress has taken place around large municipal centers since great distances between towns and poor roads will put off interurban development for some time. About 400 buses are in use in the Union, about half of them being in Capetown, Durbon and Johannesburg. Every city is considering the use of buses either to replace or supplement municipally owned tram systems. Most buses are privately owned and are 1 ton to 1½ ton standard truck chassis with local bodies. A present trend is toward the use of special American built bus chassis. It is estimated that sales in 1925 will not exceed 100, and if 1926 sales reach 175 and 1927 250 it will be considered satisfactory.

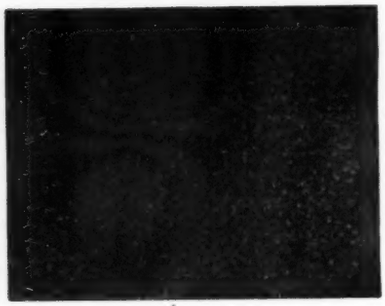


Fig. 1—Radiograph of an aluminum alloy sand casting, showing general unsoundness. (Actual size)

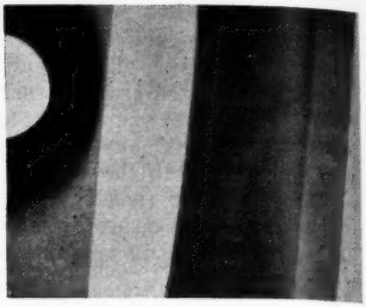


Fig. 2—Radiograph of a permanent-mold cast aluminum alloy piston, showing uniform soundness. (Actual size)

Aluminum Alloys for Piston Castings Must Meet Varied Requirements

Must be low in cost, of ingredients easily alloyed, handle well in foundry, be easy to machine, have good mechanical and physical properties and proper micro-structure.

By Dr. Robert J. Anderson*

THE aluminum-alloy piston is employed by 27 makers of American motor cars, including the volume producers Dodge, Hudson-Essex, Chrysler, and several others with large outputs, and is a thoroughly standardized product. Practically any American motor car so far built can be serviced for aluminum-alloy pistons by replacement-parts dealers, and the volume of business in this end bulks large.

Hitherto, most of the investigative work carried out on aluminum-alloy pistons has been concerned chiefly with matters of design and clearance allowances in order to secure the maximum efficiency and best operation under service conditions. Relatively little work has been done on the selection of alloys for piston manufacture, the usual alloy being a modification of the standard 90:10 aluminum-copper alloy. The present article has for its object a discussion of the aluminum-alloy situation as regards pistons, the subject being considered from the points of view both of the piston manufacturer and the motor car builder.

A "best" alloy for pistons should possess the following attributes: (1) low in price for raw materials; (2) easily alloyed and made up under conditions of fast foundry practice; (3) suitable for casting; (4) easily machineable; (5) good mechanical properties; (6) good physical properties; (7) good wearing qualities; and (8) suitable microstructure and occurrence of metallographic constituents.

Care Required in Selection

No one alloy can combine all the most desirable features, and in selecting an alloy compromise must be made so as to choose the one which combines the greater number of preferred characteristics and still not be seriously faulty as regards any essential requirements.

From the point of view of the piston manufacturer, it is desired to use an alloy having the following attributes: (1) Low in cost for raw materials; (2) easily alloyed and handled under the usual conditions of fast practice; (3) suitable for casting, *i. e.*, one having relatively low shrinkage and giving sound castings free from blowholes, cracks, porous spots, black spots, hard spots, and other defects which cause wasters; and (4) easily and rapidly machineable.

Any alloy giving difficulty in casting under production conditions is useless from the point of view of the piston manufacturer, although it may have many desirable features. The great bulk of the aluminum-alloy piston output is made in permanent molds. The success of this process depends upon thorough standardization of all operations, and anything which upsets the regular operation of a mold, such as an alloy which is removable with difficulty on casting, is rigidly guarded against.

From the point of view of the motor car builder, and also as regards performance under service conditions, it is desired that the alloy possess certain mechanical and physical properties, and, assuming correct piston design, the following are emphasized: (1) Proper hardness—this is normally 90-110 Bhn. (500 kg., 10 mm., 30 secs.), although some specifications call for 105-130; (2) high strength and elastic limit, and, in particular, ability to maintain strength well at elevated temperatures, up to 250 deg. C. at least, and preferably up to 350 deg. C.; (3) as low thermal expansivity as possible; (4) as high thermal conductivity as possible; (5) proper microstructure, *i. e.*, uniformity of structure and uniform distribution of constituents; and (6) good wearing qualities under service conditions.

When a manufacturer produces pistons for the replacement trade, the above items become as important to him as to the motor car builder. The piston manufacturer who has had long experience with the replacement trade appreciates the problems both of the producer and consumer and is in better position to assist the motor car

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builder than the manufacturer who makes pistons for the volume consumer solely.

The cost of any piston alloy is governed mainly by the composition, *i. e.*, by the prices of the contained metals. Binary aluminum-zinc alloys are the cheapest of the usual aluminum casting alloys (the market price of zinc being about 8 cents per lb.), but the zinc bearing alloys are not suited for motor pistons, since they are excessively weak and have very low shock resistance at elevated temperatures. Copper is the cheapest hardener for aluminum next to zinc, considering the usual and useful alloying metals, and hence, in order to keep the cost down, copper is generally employed as an alloying metal with aluminum for pistons. Omitting from consideration for the moment so-called "Y" alloy (92.5:4:1.5:2 Al-Cu-Mg-Ni) and other low-copper heat-treatable alloys, the usual piston alloy is evolved by suitable alteration in composition of the standard 90:10 aluminum-copper alloy.

Other Factors in Cost

The cost of any alloy is also governed by the cost of making up heats or alloying in the foundry. If metals of high melting points or those obtainable with difficulty in suitable form are used, the cost of preparation is necessarily higher. Thus, it costs more to make nickel-bearing alloys than copper-bearing alloys, because in the case of the former nickel must normally be added in the form of an intermediate alloy (hardener), while copper can be added as such. Where the use of intermediate alloys can be avoided, money can be saved.

In order to keep down the cost of raw materials as well as the cost of alloying, it is advisable to avoid the use of high-priced metals, or at least use them in small amounts, *e. g.*, magnesium, and also to avoid the use of high-melting-point metals which entail the employment of hardeners. The "Y" alloy will cost about 4 cts. per lb. more for raw material than an usual modification of 90:10 aluminum-copper alloy.

The progressive piston manufacturer can supply any composition desired on specification, but in a competitive market on any product the aim is to keep raw materials costs as low as is warranted by the specifications. In some cases, the piston manufacturer would prefer to use a higher priced alloy to meet particular specifications, but is unable to do so because he cannot get a high enough selling price to warrant such higher cost for raw material. The price of aluminum-alloy pistons is governed in the main by the cost of primary aluminum and of foundry labor.

Solid Alloys Are Best

Any metal that can be readily alloyed with aluminum by adding it in the solid state to liquid aluminum has an advantage over metals which must be introduced through the vehicle of an intermediate alloy. This immediately suggests avoiding metals of high melting points for alloying. Metals of high melting point can, of course, be alloyed with the relatively low melting point aluminum, but where the melting point of the additive metal is very high, like that of nickel or manganese, the rate of solution is slow if the metals are added directly; if hardeners are used, the hardener may have previously been burned in process of manufacture, with the consequence that drossy spots may appear in the final castings. If the fixed addition of the solid elemental metal can be readily made in the melting furnace, then the cost of making hardener is saved.

Metals of low melting point, like tin, zinc, and magnesium, alloy readily with liquid aluminum when added in the solid state. Copper, although having a comparatively high melting point, can be readily alloyed directly with the aluminum in the ordinary melting operation, provided that the copper is in the form of light clippings or punchings; heavy ingot copper goes into solution slowly. Iron, silicon, nickel, and manganese all have high melting points, and in general these metals should be added through the medium of a suitable rich alloy. Light gage tin-plate is suitable for making iron additions, while light gage nickel wire is satisfactory for introducing nickel; such wire is, however, prohibitively expensive. The use of substantially pure silicon in making up silicon-bearing alloys, like "Alpax," is urged by some producers in place of an intermediate silicon-aluminum alloy, but the writer's experience has been that this is not satisfactory.

From the point of view of alloying, the less complex the alloy the better, since it is made up more readily and is easier to maintain to a required composition. The less trouble that is experienced in making up the alloy the better, and ease of alloying means lower costs to the consumer of pistons.

As mentioned previously, the bulk of the aluminum-alloy pistons consumed in the United States are made by the permanent mold process. Alloys which are suitable for casting in sand may not give good performance in permanent molds, and, accordingly, alloys for use in the latter process must be chosen with the peculiarities of this process in view. If an alloy does not have good casting qualities, it is practically useless for piston production in permanent molds. In sand practice, the founder can worry out the casting of almost any alloy into a part like a piston by variation in gating methods, use of chills and risers, and other devices which are impossible in permanent mold casting.

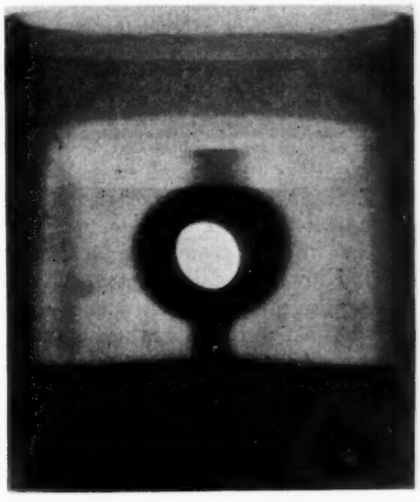


Fig. 3—Radiograph of a permanent-mold cast aluminum alloy piston. (Half size)

Casting Behavior

Casting behavior is a quality not easily defined in a precise manner, but essentially good casting quality assumes that the alloy will be well fluid (flow freely) at the proper pouring temperature, have relatively low shrinkage (in order to minimize the occurrence of cracks and draws), cast soundly with freedom from blowholes and porosity, give clean castings (*i. e.*, free from hard spots and inclusions), and not stick to the mold walls and cores, thereby slowing up production.

Fluidity is governed by the temperature and composition. In general, the higher the temperature, the more freely and quickly does the alloy flow. Little is known as to the effect of composition on fluidity, *i. e.*, viscosity, but high iron content in an aluminum alloy increases viscosity and also the number of wasters in production. In

general, alloying elements which raise the melting point of aluminum increase the viscosity for a given pouring temperature. Fluidity is a function also of the surface tension, and no data are available as to the surface tension of different aluminum alloys. Practical experience has indicated that certain alloys have greater fluidity than others.

In sand practice, other things being equal, the alloy having the lowest contraction on freezing and the lowest thermal expansion in the solid state is the most suitable for casting. The greater the contraction, the greater the tendency to cracking. Alloys having very low contraction, like the 87:13 aluminum-silicon alloy, are not good for permanent-mold work where there is complicated coring with collapsible steel cores. The reason for this is that an alloy of very low contraction does not shrink enough on freezing to permit ready extraction of the cores, sticking results, and slow and difficult mold operation follows. On the other hand, alloys with very high contraction shrink severely around the cores, hold them fast, and also cause sticking in the molds. From the results of contraction experiments and practical experience with the operation of piston molds, alloys have been developed which give highly satisfactory results.

Cracking on Casting

As regards cracking on casting, it may be added that alloys having greater strength at elevated temperatures crack less readily than those having lesser strength. Since high strength at elevated temperatures is desirable for piston alloys in general, in order to increase wearing qualities, the use of additive metals like nickel or manganese is indicated to secure this property. Also, alloys having higher impact resistance crack less readily than those having lower resistance.

Aluminum alloys when cast in sand tend to be more or less unsound, while when cast in permanent molds they are generally uniformly sound, as has been shown conclusively by X-ray examination†. Fig. 1 shows a radiograph of an average sand casting in an aluminum alloy, indicating general unsoundness. Fig. 2 is a radiograph of a permanent mold cast aluminum-alloy piston showing uniform soundness and absence of blowholes. Fig. 3 is a silhouette radiograph of a permanent mold cast piston, showing absence of internal flaws.

The permanent-mold process is definitely indicated as being superior to sand casting for the production of sound piston castings with uniform structure. Freedom from hard spots and other inclusions is a question of alloying and melting practice, and normally is withing control of the manufacturer.

Other things being equal, the alloy which machines fastest and most easily is the most desirable from the production point of view. This refers to large motor car builders who put several thousand pistons through a machine line-up per day, as well as to producers of pistons for the replacement trade, and also to regrinders.

Roughly, the Brinell hardness is a guide to the machineability, and alloys with Bhm. of 90-100 normally machine fast and well with the customary rakes, clearances, speeds, and feeds. High Brinell hardness (110-120) indicates alloys hard to machine. Low Brinell hardness (70-80) indicates alloys which will drag and tear on the cutting tools—such alloys are too soft to machine well.

Little scientific knowledge has been acquired regarding the relation between composition of alloy and ease of machining, but recent experimental work has shown that

†R. J. Anderson, X-ray examination of aluminum-alloy castings for internal defects, paper before the Amer. Foundrymen's Assoc., Syracuse meeting, Oct., 1925.

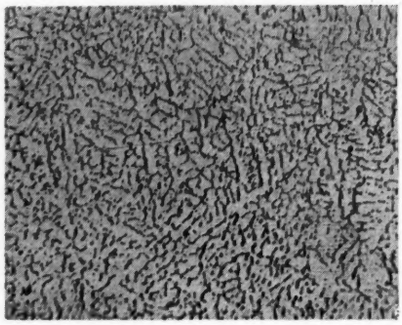


Fig. 4—Average structure of 89.7:10: 0.3 Al-Cu-Mg alloy, chill-cast piston, unetched x 100. (Daniels).

the composition does have a marked effect on machineability irrespective of the Brinell hardness within limits. Much can be done to improve the machineability of various aluminum alloys without simultaneously altering their hardness of strength within certain limits.

To sum up: From the machining point of view, for pistons an alloy is desirable which will cut freely and easily. Hard spots and other inclusions should be absent from the castings, since these give trouble in rapid machining practice.

Taking up now the question of the mechanical properties desired in a piston alloy, the alloy should have the proper hardness in order to ensure good wearing qualities, and also good strength. As mentioned previously, an alloy which maintains strength well up to about 350 deg. C. is desirable. An usual piston specification calls for 90-110 Bhn., while some call for 105-30, and 96-124. In connection with hardness as well as machineability, it may be pointed out that many aluminum alloys exhibit pronounced aging properties on standing in air at the ordinary temperature after casting. Thus, of some 60 alloys examined by the writer for aging properties as regards hardness, the Brinell hardness rose an average of 10 points in 30 days or less, with a range of 0-29 points for the extreme limits of the rise. Similarly, if an alloy increases in hardness markedly on aging in air after casting, the machineability is quite noticeably affected. Thus, if the Brinell hardness of an alloy is 90 as cast, and it machines easily, and if it rises 15 points in, say, 20 days, then it will genereally machine hard at the end of 20 days.

Aging Effect Important

The aging effect must be taken account of by the piston manufacturer and should be by the piston consumer.

The tensile strength of the ordinary 90:10 aluminum-copper alloy, chill cast, is around 26,000 lbs. per sq. inch, with elongation of about 1.8 per cent (2-inch length), and Bhn. of 78. Of the more common alloys, "Y" alloy is the strongest as cast, having tensile strength of around 31,000 lbs., with elongation of 1.9 per cent and Bhn. of 100. While the strength of certain aluminum alloys at the ordinary temperature may not be much affected by the presence of certain additive elements in relatively small amount, the strength at elevated temperatures may be most markedly affected. Numerous reliable data are available in regard to this matter, and if aluminum alloys with exceptional strength at moderately elevated temperatures are required, they can be had. The relative strengths of several alloys at 250 deg. C. are as follows: 89:8:1:2 Al-Cu-Mg-Ni, 26,000 lbs.; "Y" alloy, 26,000 lbs.; 89:9:2 Al-Cu-Ni, 20,000 lbs.; 85:14:1 Al-Cu-Fe, 19,000 lbs.; and 90:10 Al-Cu, 15,000 lbs.

Manganese, iron, and nickel are the additive elements which confer greatest strength at elevated temperatures. Magnesium in certain proportions in combination with nickel in aluminum-copper base alloys has the effect of

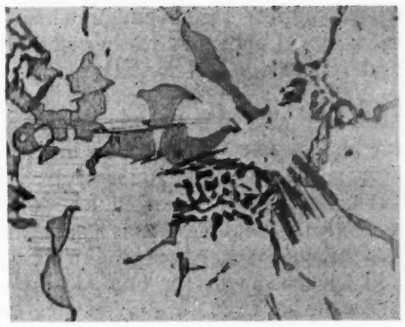


Fig. 5—Same as Fig. 4, but x 1,000. (Daniels).

increasing the strength most markedly at relatively high temperatures, but further increase in the magnesium content causes falling off in strength at both ordinary and elevated temperatures. Manganese has the disadvantage of increasing the shrinkage of aluminum alloys in general and of seriously lowering the thermal conductivity. Nickel has the advantage of actually increasing the thermal conductivity of binary aluminum-copper alloys. A fair amount of data are available on the impact resistance of the light alloys, and these indicate that an addition of nickel (½ per cent) to the usual aluminum-copper base alloys assists in maintaining the resistance of 250 deg. C. The strength of the usual piston alloys varies between 20,000 and 26,000 lbs. per sq. inch as cast and at the ordinary temperature, and falls off markedly at 250d C. The addition of ½ per cent nickel to the 90:10 Al-Cu base alloy is indicated to ensure maintenance of strength and hardness at elevated temperatures.

The heat treatment of aluminum-alloy pistons cannot be dealt with in the present article, but heat treatment is applied both to the high-copper and low-copper type alloys, while "Y" alloy is used in the heat-treated condition for aviation engine pistons. Heat treatment is carried out for the purpose of enhancing the strength and hardness.

Destruction Test

A requirement which is incorporated into piston specifications by some consumers is the destruction test. In this, a piston casting is broken under tensile loading, the casting being held rigidly by the head in a suitable shackle and the pull exerted through a bar passing through the wrist-pin holes. The destruction test value is expressed in lbs. of actual load, and the load withstood depends upon the size of section at the bosses and the composition and mechanical properties of the alloy. High strength and high elongation in the alloy give high destruction test values, while low elongation tends to give low destruction test values. The test is simply a control of manufacturing operations used by the piston producer and has no technical basis. Thus, taking a particular type of piston where the destruction test specification is 10,000 lb., a suitable modification of the 90:10 aluminum-copper alloy will yield a value of say 12,000 lb. with 95 Bhn., while in the same piston the 87:13 aluminum-silicon alloy will yield a destruction value of 22,000 lb. with 55 Bhn.

There are serious faults in the destruction test, from the point of view of the piston manufacturer, as it is now specified.

The physical properties of aluminum alloys which are of greatest importance in the case of pistons are the thermal conductivity and thermal expansivity. For rapid heat dissipation under engine running conditions the thermal conductivity should be high, while in order to permit close clearances the thermal expansion should be low. The "best" alloy will, therefore, have the highest possible conductivity for heat and the lowest possible coefficient of thermal expansion. Both these properties depend upon the composition of the alloy. From the point of view of power development, the alloy should have as low specific gravity as possible.

Referring first to thermal conductivity; one of the greatest advantages possessed by aluminum alloys in their use for pistons in place of cast iron lies in their high thermal conductivity. The thermal conductivity of substantially pure aluminum may be taken as 0.48-0.52 gm. cal. per deg. C. per cm. per sec. This may be compared with 0.102 gm. cal. for cast iron. Aluminum alloys possess the advantage of increasing in thermal conductivity with increase in temperature, while the conductivity of cast iron decreases.

The thermal conductivity of the 88:12 Al-Cu alloy at the ordinary temperature is about 0.30 gm. cal. as cast. Manganese, chromium, and iron decrease the thermal conductivity of aluminum-copper base alloys, while nickel notably increases it. In general, the greater percentage of additive elements in an alloy, the less the thermal conductivity. Annealing generally decreases the conductivity, as does quenching. Hence, a heat-treated aluminum-alloy piston will have lower thermal conductivity than an as-cast piston. Numerous reliable data on the thermal conductivity of a variety of aluminum alloys are available, and the effects of several additive elements on this property are known. Of a variety of alloys, it has been found that "Y" alloy and the 91:8:1 Al-Cu-Ni alloy have the highest thermal conductivity, *viz.*, about 0.41 0.42 K (c.g.s. units) at 300 deg. C. This is about four times the value for cast iron (as-cast samples).

Why Nickel is Used

An addition of nickel to aluminum alloys for pistons is indicated for several reasons: (1) to increase strength (at elevated temperatures) and wearing qualities; (2) to increase the thermal conductivity; (3) to increase the hardness; and (4) to give better finish on grinding. Nickel-bearing alloys, however, machine harder than corresponding non-nickel-bearing alloys.

As regards thermal expansion: The thermal expansion of substantially pure aluminum (99.5 per cent) from room temperature to 610 deg. C. is represented by the equation

$$L_t = L_o [1 + (22.58t + 0.00989t^2) 10^{-6}]$$

while the thermal expansions of the light aluminum alloys vary considerably, depending upon the chemical composition. The average coefficient of expansion of the substantially pure metal in the range 20-300 deg. C. may be taken as 25.7×10^{-6}, that of 90:10 Al-Cu alloy is 28.1×10^{-6}, that of 88:12 Al-Cu alloy as 28.6×10^{-6}, and that of "Alpax" (87:13 Al-Si alloy, modified) as 22.2×10^{-6}. Silicon reduces the thermal expansion of aluminum, while most alloying metals increase it.

The microstructure of an aluminum alloy depends upon its chemical composition, kind of mold into which poured, and the temperature of casting. The question of microstructure cannot be dealt with at length here, but from the point of view of motor performance and the erosion of piston heads under service conditions, it is desirable to use alloys having as little of relatively low-melting-point eutectiferous matter present as possible and also of high softening points as in feasible. Hence, heat treatable alloys of the low copper duralumin type are indicated; with these, the great bulk of the eutectiferous matter is put into solution on heating for quenching, and thus eliminated. Moreover, the melting points of these alloys are higher than those of the high-copper alloys. Slow cooling (as in sand practice, and also in permanent molds with very hot molds and high pouring temperature) conduces to large segregated masses of eutectiferous $CuAl_2$, $FeAl_3$, $NiAl_3$, and other intermetallic compounds. The burning of heads has been

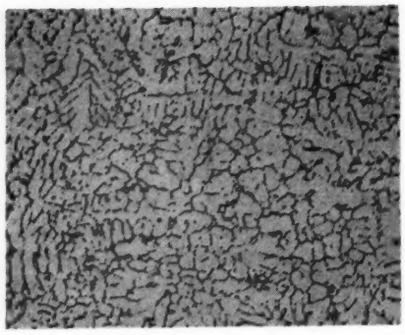


Fig. 6—Average structure of 88.5:10:0.5:1 Al-Cu-Mg-Ni alloy, chill-cast piston, unetched x 100. (Daniels)

traced to the melting out of eutectiferous matter, and burning tendencies would naturally be reduced by the adjustment of composition so as to secure practically solid-solution alloys on suitable heat treatment. This consideration indicates the use of heat-treated aluminum-alloy pistons rather than unheat treated, but a higher price for the former is justified as compared with the latter.

Figs. 4, 5 and 6 show some microstructure of sections taken from aluminum-alloy pistons. Fig. 4 shows the average structure of a chill-cast piston of the 89.7:10:3 Al-Cu-Mg type, and Fig. 5 shows a portion of the same structure at high magnification. Fig. 6 shows the avereage structure of a piston of the 90:10 Al-Cu type containing about 0.5 per cent Mg and 1 per cent Ni.

Few reliable data are available as to the relative wearing qualities of aluminum alloys when used as pistons in internal combustion engines in relation to their chemical composition and mechanical properties. In general, however, the greater the strength, both at ordinary and elevated temperatures, together with fair elongation, the greater the hardness, the higher the thermal conductivity, and the less the thermal expansion, the longer the service, assuming proper fitting, good rings, and adequate lubrication.

The wear of pistons in engines or the service given under running conditions is considerably dependent upon proper fitting and suitable clearance, as well as upon the nature of the care given the motor (*e.g.*, lubrication); hence, it is not practical to determine wearing quality on the basis of the opinions of motorists, but extensive dynammeter and destruction tests of a series of alloys is urgently needed.

Addition of Nickel

On the basis of the unavailable knowledge, an addition of about 1 per cent nickel is indicated for the usual 90:10 Al-Cu base alloy to improve wearing qualities. At the present time, "Y" alloy is indicated as being highly suitable for aviation engines, as well as automobile motors, and its superior wearing qualities are ascribed to the presence of nickel. In tests made by the writer on pistons for the Liberty 12-cylinder aviation engine, it was shown that an addition of ½ per cent nickel to the regular 90:10 Al-Cu base alloy increased the wearability markedly and reduced erosion of the heads when testing on the block.

In discussing aluminum alloys for pistons here, the subject has been considered both from the point of view of the piston manufacturer and of the consumer (the motor car builder and the replacement trade). Alloys for pistons must meet certain definite manufacturing conditions and certain mechanical and physical requirements. These may be summarized as follows:

1. The "best" alloy from the point of view of the manufacturing situation should have the following attributes: (a) low in cost for raw materials; (b) easily alloyed and made up under conditions of fast practice; (c) suitable for casting, *i.e.*, having fairly low shrinkage and giving sound pistons free from blowholes, cracks, draws, porous spots, hard spots, and other defects which cause wasters; and (d) easily and rapidly machinable.

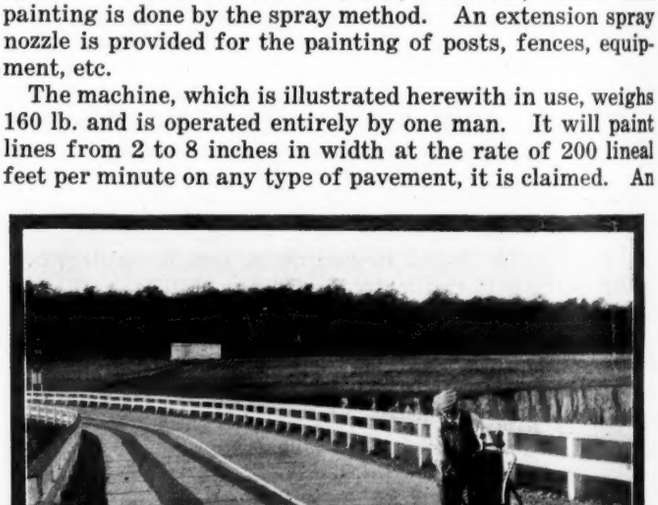
2. From the point of view of engine performance, it is desired that a piston alloy should possess certain mechanical and physical properties, and the following are emphasized: (a) proper hardness; (b) high strength and elastic limit; (c) high strength at elevated temperatures; (d) as high thermal conductivity as possible; (e) as low thermal expansivity as possible; (f) proper microstructure; and (g) good wearing qualities under service conditions.

Assuming that an alloy can be cast into pistons without too much difficulty, the piston manufacturer can furnish any alloy or meet any reasonable specification. Full cooperation between piston manufacturers and motor-car builders as regards problems encountered in manufacturing and using light alloy pistons is highly desirable and will go a long way in developing better designs, better alloys, and generally better pistons.

Painting Traffic Lines

DURING the past few years it has become customary to paint white lines along the middle of the road or street at dangerous turns and in congested districts. So far these lines have been painted by hand, as a rule, but now a machine has been developed which should greatly facilitate this work and make it possible to keep the lines always quite distinct and easily recognized, by repainting when necessary. The machine referred to is known as the Ault traffic line marking machine and is manufactured by the Tennessee Tool Works, Inc., Knoxville, Tenn. The painting is done by the spray method. An extension spray nozzle is provided for the painting of posts, fences, equipment, etc.

The machine, which is illustrated herewith in use, weighs 160 lb. and is operated entirely by one man. It will paint lines from 2 to 8 inches in width at the rate of 200 lineal feet per minute on any type of pavement, it is claimed. An



Painting traffic line by machine

interesting feature of the machine is a revolving brush for sweeping the surface to be painted in advance of applying the paint. Any of the traffic paints may be applied—cold water paint, whitewash, disinfectants, etc.

THE addition of nine sizes to the present standard list of brake linings has been suggested by a subdivision of the Parts and Fittings Division of the S. A. E. Standards Committee.